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DIESEL PROGRESS

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CONSULTOR II

JUNE, 1941

$$\frac{10,020,388 \text{ hp. hrs.}}{1,613 \text{ Gallons}} = 6212 \text{ hp. hrs./gal.}$$



WORTHINGTON DIESELS, two of 625 hp. and one of 375 hp., making an enviable record for low operating costs in the Waverly, Iowa, power plant... lubricated with TEXACO 100%.

$$\begin{array}{r} 6,212 \\ - 2,260 \\ \hline 3,952 \end{array}$$

$$\begin{array}{r} 3952 \\ - 2260 \\ \hline \end{array}$$

175%
MORE H.P. HOURS
PER GALLON!

OPERATING a total of 10 million hp. hours, in a Waverly, Iowa, power plant, these 3 Worthington Diesels have averaged 6212 hp. hours per gallon of lubricating oil.

This is 175% more hours than the national average (2260) reported by A.S.M.E.

Throughout their 3 years of low-cost operation, these Diesels have been lubricated exclusively with TEXACO.

The *Texaco Ursa Oil* series provide that wear-defying lubricating film that withstands high Diesel operating temperatures and pressures, that assures effective piston seal, full compression, maximum fuel economy.

Because of these savings:

More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

The outstanding performance that has made Texaco first in the Diesel field has also made it first in the fields listed in the panel.

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The Texas Company, 135 East 42nd Street, New York, N. Y.

JUST PUBLISHED! 1941 revised and expanded edition of Texaco's popular Diesel Operation Manual. 92 pages of helpful charts, diagrams, photographs and text, along with complete Diesel lubrication chart. Yours for the asking.



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THEY PREFER TEXACO

- ★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.
- ★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.
- ★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.
- ★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.
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TEXACO Lubricants and Fuels
FOR ALL DIESEL ENGINES

DIESEL PROGRESS for June, 1941. Volume VII, Number 6. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., authorized March 27, 1940. Subscription rates: United States and Possessions \$3.00. Canada and all other countries \$5.00 per year. Single copy price 25 cents in U. S. A., 50 cents for all other countries.

DIESEL *and* GAS ENGINE PROGRESS

REX W. WADMAN
Editor and Publisher

JUNE CONTENTS

FRONT COVER ILLUSTRATION: Bushey builds them better and faster. This very modern, all-welded steel tug, the *Consultor II* now in service on the great lakes, and an identical sister ship, the *Crusader II* were recently completed. Both tugs are powered with Fairbanks-Morse main and auxiliary Diesels. See article on pages 46 and 47 of this issue.

TABLE OF CONTENTS ILLUSTRATION: Owned by E. L. Sage & Son of Hood River, Oregon, this Caterpillar Diesel tractor consumes 1 1/4 gal. of 7c fuel per hour, working ten hours a day. It is shown here disk harrowing a cherry orchard.

DIESEL PROGRESS for June, 1941, Vol. III, No. 6. Published monthly by Diesel Engines, Inc., 2 West 45th Street, New York, N. Y. Tel. MUrray Hill 2-5092. Subscription rates: U. S. A. and Possessions, \$5.00 per year; 25c per copy. All other countries, \$5.00 per year; 50c per copy.

HEYWORTH CAMPBELL
Art Director

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GAS ENGINES SAVE \$25,000

A YEAR

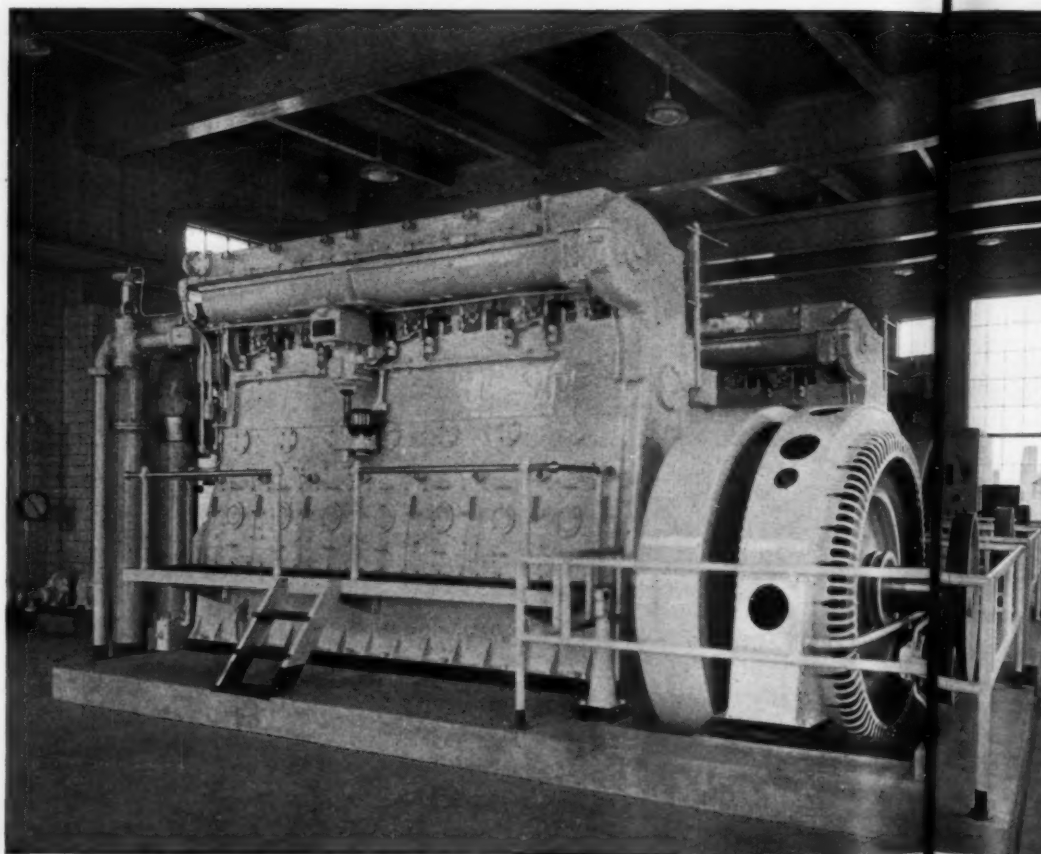
By WILBUR W. YOUNG

EXTENDING over twenty-five acres just outside the city of Columbus, Ohio, is its modern municipal sewage treatment plant which serves well over 300,000 people. The new plant, representing a \$4,000,000 investment, was calculated for an ultimate sewage flow of fifty million gallons per day from a population of 400,000. Its widely separated buildings (two-thirds of the plant is underground) are built of native stone and finished inside with ceramic glazed brick. All piping is painted aluminum and all machinery is finished in cream gloss enamel. The entire plant presents a gleaming, spotless appearance which bespeaks meticulous care and maintenance.

The sewage treatment cycle may be outlined briefly as follows: The sewage is first conducted to chambers where grit is removed; then to primary settling tanks where heavy solids settle out; from there to aeration tanks where a large volume of air is blown through the sewage to promote the growth of bacteria, which are the basis of the activated sludge process; then to the final settling tanks where the solids formed by aeration are separated from the effluent (95% pure water) which is discharged to the river. The solids which are removed in the primary and final settling tanks are digested in large, underground tanks and in this process a considerable volume of gas is generated.

This plant is especially well planned and well built. It enjoys the reputation of being the most highly mechanized plant of its kind in this country, there being some 175 electric motors throughout the many buildings. The total electrical load is 1800 kw. which results in a daily power consumption of 43,200 kwh.

The problem of powering the many pumping, blower and filtering services involved two interesting factors which led to the selection of internal combustion engine generating equipment. First, there was the large volume of gas, available from the normal sludge digesting process, which could either be wasted by burning it off or be made available for engine fuel; second, was the inability of the local utility to assume this electrical load during its peak demand period. An ideal solution resulted in the installation of three gas engine-generator



General view of the spotless engine room, showing the three Rathbun-Jones gas engines and General Electric generators.

units of a total capacity sufficient to handle about two-thirds of the plant load and which absorb the average daily gas production during sixteen hours of operation between 7 A.M. and 11 P.M. Some gas is purchased from an outside source as required to supplement the normal supply. The balance of the day is the utility's off peak period during which it assumes the entire sewage treatment plant load. Gas is accumulated in a 150,000 cu. ft. waterless holder over night, the quantity produced by each digester

0 tank being individually metered. Total gas production is about 500,000 cu. ft. per day.

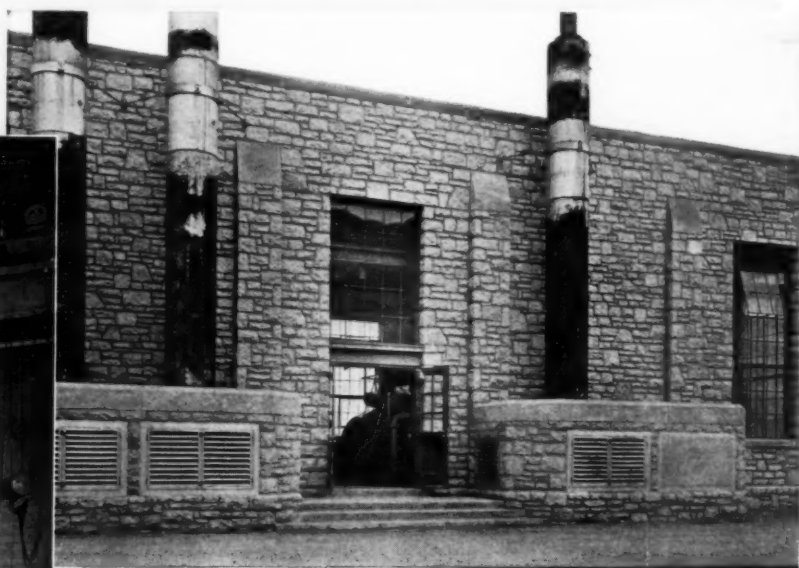
The engines are each 7 cylinder, 15½" bore, 22" stroke, rated 750 hp. at 300 rpm., direct connected to 500 kw. alternators. Specially designed for operation on digester gas fuel, the engines perform very satisfactorily with the minimum of maintenance. Each engine consumes about 11,000 cu. ft. of gas per hour. An isochronous governor is fitted to each engine

for close regulation, two spark plugs are provided for each cylinder and a diaphragm valve in the lube oil line is arranged to cut off the fuel supply in the event of sub-normal lube oil pressure. All cylinder lube is batch reclaimed in a centrifugal machine, the oil being pre-heated in a shell and tube type exchanger and an electric heater. Crankcase lube oil is being changed only once a year and is giving excellent service on this schedule. Heat exchangers are fitted to the jacket cooling systems to sup-

plement the cooling secured in supplying heat to the digester tanks from the engine jacket cooling water. Lube oil coolers are of the shell and tube type.

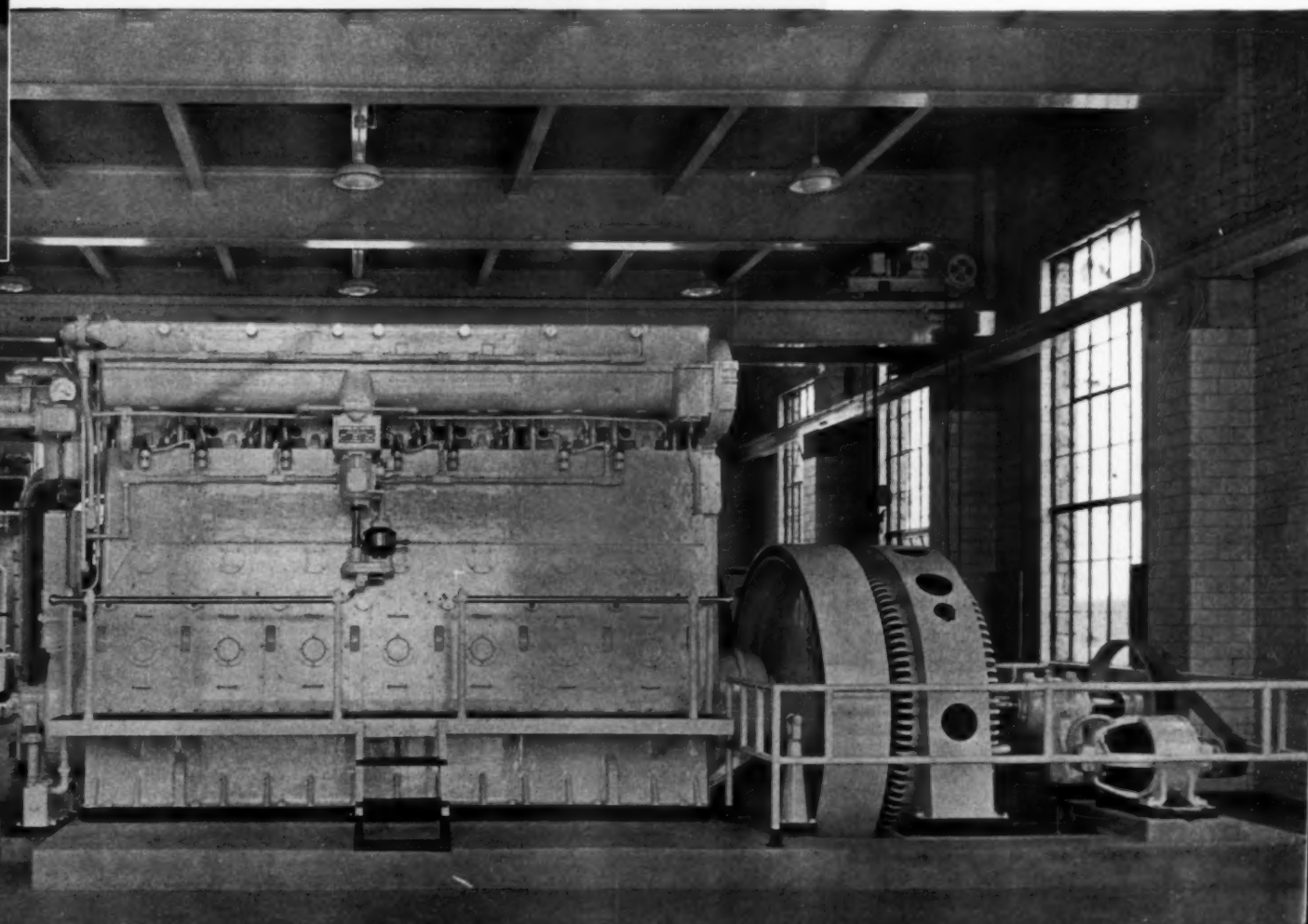
As compared with the purchase of the total electric current requirements at prevailing rates, this gas engine generating plant is saving approximately \$25,000 per year, which is amortizing the overall investment at a satisfactory rate.

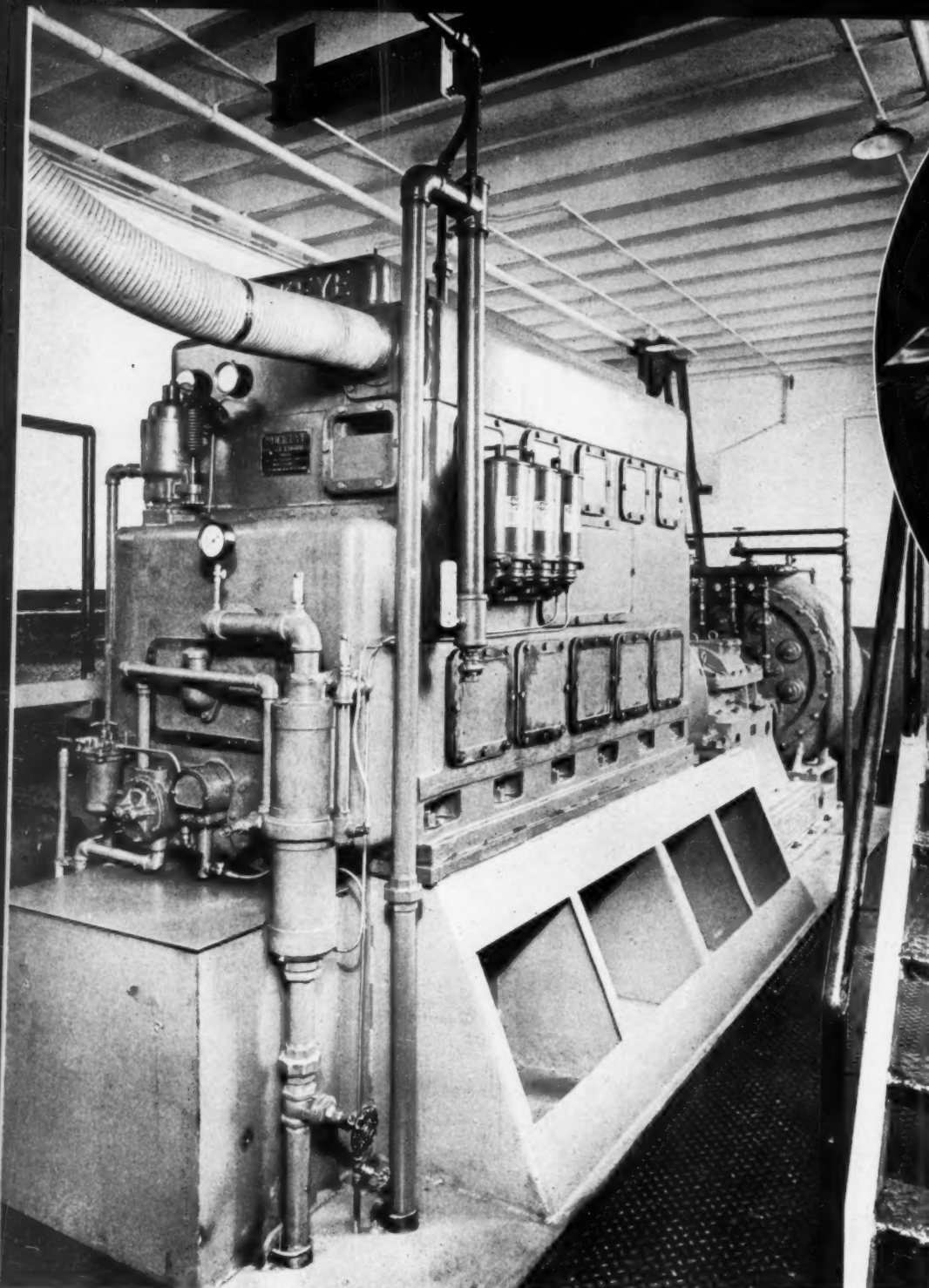
The items of equipment essential to this highly successful generating plant are, of course, headed by the three 7 cylinder, 750 hp. gas engines by Rathbun-Jones Engineering Co., alternators by General Electric, in fact all electrical equipment throughout the plant, including the elaborate switchgear and instruments, is G. E. with the exception of two 900 hp. and two 700 hp. Elliot induction motors which drive the four Elliot 3-stage centrifugal aerating blowers. Engine governors are Woodward IC; ignition is Rathbun battery; intake air filters are American OCH; exhaust silencers are Maxim; jacket cooling heat exchangers by Ross; lube oil coolers by Griscom-Russell; lube oil pre-heaters before reclaiming by Schutte-Koerting and Haynes; lube oil centrifugal reclaimed by De Laval; lube oil, Marathon V.E.P. by Ohio Oil; individual rotary type fuel meters for each engine by Roots-Connersville, and eight large meters registering the gas flow from each digester tank by Pittsburgh Equitable.



↑ Exterior view of the native stone engine building showing Maxim exhaust silencers and intake grills.

↓ Ignition side of engine showing distributor, center, made by Rathbun-Jones using American Bosch parts.





Main Buckeye Diesel and dredge-pump. Note De Luxe lube filters, Purolator fuel filter, Pickering governor just above which is seen the Alnor pyrometer.

THE countless visitors from everywhere in the country who have toured the Gulf Coast section never forget the many miles of scenic boulevard running along the seawalls in the state of Mississippi. The waters of Mississippi Sound, that portion of the Gulf of Mexico between the mainland and the shores of the outlying string of islands and keys some ten miles seaward, are quite shallow and ordinarily fairly calm. During heavy blows from southerly points, however, much damage from the choppy surf was formerly done to the shoreline highways, necessitating seawall construc-

tion. The miles of step-type walls have since prevented highway washouts resulting from the sea's violence, but surface drainage and the resulting hydrostatic pressure from landward continually undermines the seawall. Continuous repairing and maintenance is essential. To remedy this situation once and for all, Hancock County—the west end of Mississippi's seashore—has determined to fill in a sloping beach against the front of the seawall. While this beach itself will require occasional touching-up, the seawall, nevertheless, will be efficiently protected against back-pressure as well as provid-

ing a far more attractive and pleasant waterfront for vacationists who visit this spot.

After considering the problem of dredging costs from all angles, Hancock County Board of Supervisors, Mr. C. B. Murphy, President, decided that public interest would be served most economically in the long run by a county-owned-and-operated dredge. A dozen miles of sloping beach, pumped in eight or ten feet high against the wall and sloping out for two hundred feet, requires considerable dredging. The savings in county-ownership as against contracted dredging are expected to pay for the dredge in a very few years' time, after which the county will be able to effect all further beach repair at a low cost.

The smart new dredge "W. J. Gex," named in honor of one of Hancock County's public spirited citizens, is the result. The designing of a satisfactory dredge presented its problems. Shallow draft was imperative, owing to scant depth of water all along the beach. Ample



The Caterpillar Diesel generating unit.

"W. J. GEX"

By WARREN GLEASON

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The Diesel dredge "W. J. Gex," owned by Hancock County, State of Mississippi.

power was a further essential, as the sand will be pumped in from perhaps two thousand feet offshore; no deep holes resulted from dredging operations can be tolerated near the shore on bathing beach. Design and construction of the dredge hull was executed by the Lester Alexander Co., Inc., at its plant in New Orleans. Dimensions are 60' overall length and 28' beam, this size of hull being ample to carry the weight of a heavy power plant and permit a draft of only about two and one half feet.

The main power unit is a Buckeye Diesel engine of five cylinders, 10" bore and 12" stroke, and developing 240 hp. at 514 rpm. Sale and installation of the engine, as well as the engineering of the entire mechanical and electrical layout, was handled by New Orleans Electric Engineering, Buckeye distributors in the New Orleans trade area. The engine is direct connected by a Falk flexible coupling to a pump designed especially for this installation by Mr. Bradley S. Carr, designing engineer for the American Manganese Steel Company. Erection of this Amsco counterflow pump, with its 10" suction and 8" discharge, as well as all piping and testing operations, received Mr. Carr's personal supervision. Pump shaft and impeller are supported by a pedestal type Shafer bearing, water-cooled, measuring 20" in length with a 5" diameter, carrying a double marine thrust built in the center of the bearing. The pump is designed for a maximum speed of 550 rpm. and is able to pump against 2500 feet of pipe line; adjustments of the impeller can be as close as 1/1,000 of an inch. In addition to the main Buckeye engine, a

Caterpillar Diesel generating unit of 131 hp. at 917 rpm. supplies electricity for motor-driven auxiliaries. The Caterpillar is direct connected to a General Electric main generator of 70 kw. capacity at 900 rpm., 125-250 v DC. This supplies current for a 40 hp. motor driving the revolving-type cutter-head, a 15 hp. motor handling the hoist, a 10 hp. motor turning the general service pump for priming and providing sealing water for the counterflow pump, as well as the battery of other units such as air-compressor, bilge and fire pumps, pumps for fuel transfer and for raw and cooling water in the heat exchanger.

Operation of the Buckeye engine is very satisfactory to the dredge engineers, particular commendation being extended to the Alnor Pyrometer system with its thermocouples for each cylinder and the selective switch at the operator's position giving instant reading of the temperature of any cylinder. Other welcome features include the patented Buckeye Silent Watchman, the device which automatically stops the engine in event of lube or cooling failure. Bosch fuel injection is employed, with Purolator fuel filtering. A DeLuxe Clean-Oil filter protects the lube oil and a Pickering governor regulates engine speeds. The Sims heat exchanger has a capacity of 150 gpm. and maintains a temperature of 140° in the closed jacket water system, using sea water for cooling.

Another interesting feature of the dredge is the dredge pipe itself. This pipe is in 40' lengths, spiral lock-seam welded, made by the Naylor Pipe Company. The pontoon supporting system is of unique design, the float being a cylindrical section shrouding the center of each 40' length and made integral with the

pipe, a feature which greatly speeds up the moving of the pipe-line.

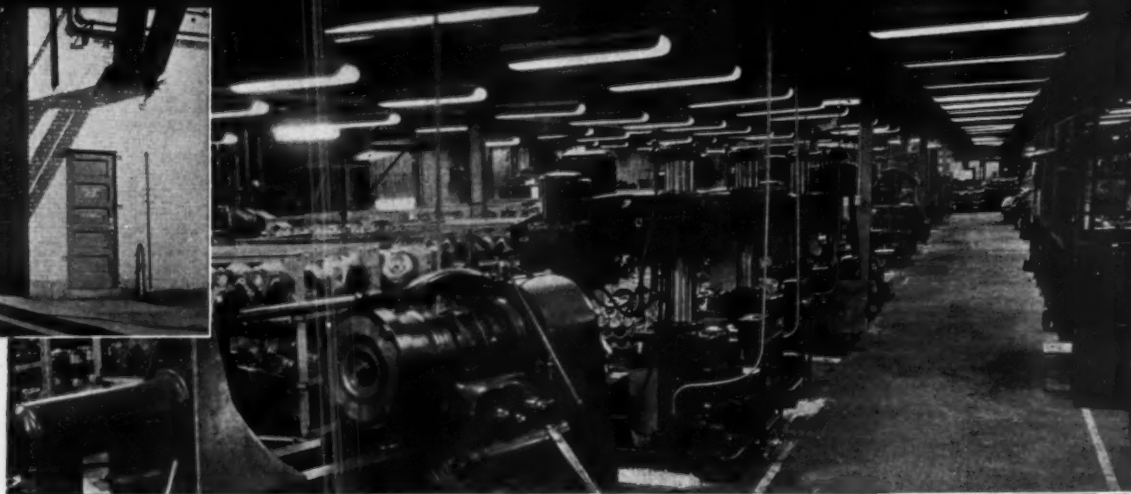
The switchboard, all-steel and dead-front type, was constructed for the job by New Orleans Electric Engineering; instruments are Hickok and switches are Square-D. Motor-starters are Cutler-Hammer 230v. General service pump is by Frederick Iron and Steel, 200 gpm. at 140' head, with Imperial 10 hp. 250 v motor. Bilge pump is Goulds 2B, 110 gpm. at 40' head, 1½ hp. Imperial motor. Motor for the hoist is Westinghouse Marine, 15 hp., 230 v; cutter head motor is Star, 40 hp., 230 v. Other equipment includes a 12" Carlisle-Finch searchlight with pilot-house control and Westinghouse outdoor floodlights of 750-1500 watts for emergency night work. There is no galley and no sleeping accommodation as all operations will be conducted "close to home."

Fresh water tanks are built integrally with the all-steel, arc-welded hull; these tanks are of 3900 gallons capacity; the four fuel tanks, also built-in, provide for a total of 8,324 gallons. An auxiliary tending barge, also all-steel and arc-welded, was supplied as part of the contract; its two tanks are of 3,750 gallons each for fuel and fresh water.

It is believed that the 250 hp. Buckeye fitted with the 8" pump will be able to handle the sloping beach problem. The county supervisors and the designing engineers, however, have had future unknown exigencies in mind. In case it is ever advisable to install more power, the dredge hull construction is built to support an engine up to 600 hp. coupled to a much larger pumping unit.



Exterior of the modern radial Diesel engine plant built by Buda in 1940.



General interior view showing one of the batteries of precision machines installed for production of Buda-Guiberson Diesels.

GUIBERSON RADIAL DIESEL IN PRODUCTION

THE Guiberson radial Diesel is now in volume production as shown in the accompanying illustrations. This interesting engine, first developed for use in aircraft, is fulfilling its erstwhile destiny in the National Defense program, all of Buda's current output being installed as motive power units in Army tanks.

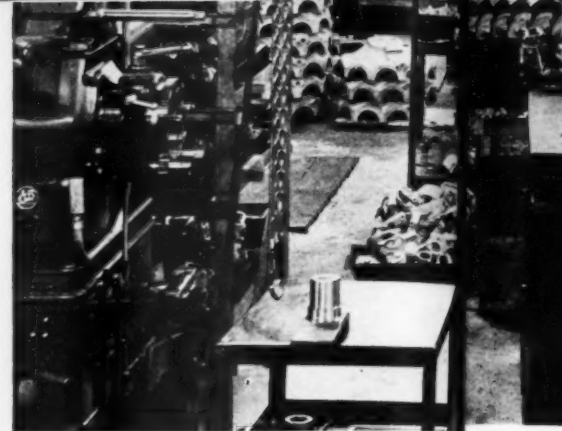
In its modern air locked plant, built and equipped throughout for the exclusive manufacture of precision parts, assembly and testing, the Buda Company is now turning out ten to twelve complete engines a day. The plant itself, representing close to a million dollar investment, is a one-story, windowless structure, having fluorescent lighting and a ventilating system which maintains a plenum within the building so that no dirt or dust can enter.

The equipment includes the latest in precision machine tools, inspection instruments and testing machinery. Keen appreciation of the needs of the moment as well as a long look to the future is shown in Buda's planning and completion of this plant in time to render both itself and the Buda-Guiberson Diesel vital fac-

tors in the present emergency as well as to be prepared for the vast fields of application which will open up in the future.

The engine is well adapted to its present uses. Its light weight and compactness, as well as the freedom from fire and explosion hazard of its fuel, amply justifies its selection for the new Army tanks that are so remarkably light and mobile that they are referred to as "Mystery" tanks.

While the output of the Buda radial engine plant is at present available only to the United States Government, Buda is looking to future uses for the engine in a wide range of commercial applications. The present engine is rated 250 hp. at 2150 rpm. Experiments are under way looking toward a rating of 550 hp. by supercharging and some thought has been given to a two-row engine which would develop 1,000 hp. It should be borne in mind, meantime, that the Buda-Guiberson Diesel is first and foremost an aircraft engine, destined to come into its own in that field by virtue of its inherent economy, dependability and safety.

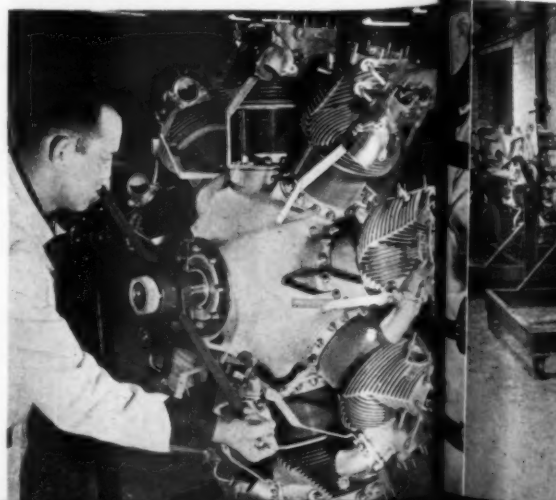


In this section finished parts of the engine are seen, grouped.



Assembling the crankshaft sub-assembly. A complete crankshaft assembly is seen right.

The Buda-Guiberson radial Diesel nearing completion here receives timing adjustment.





he engine is seen, grouped in racks, pans and tote boxes, awaiting assembly.



Milling the top face of the cylinder head on precision milling machine.



This workman is driving bushings into the cylinder head sub-assembly.



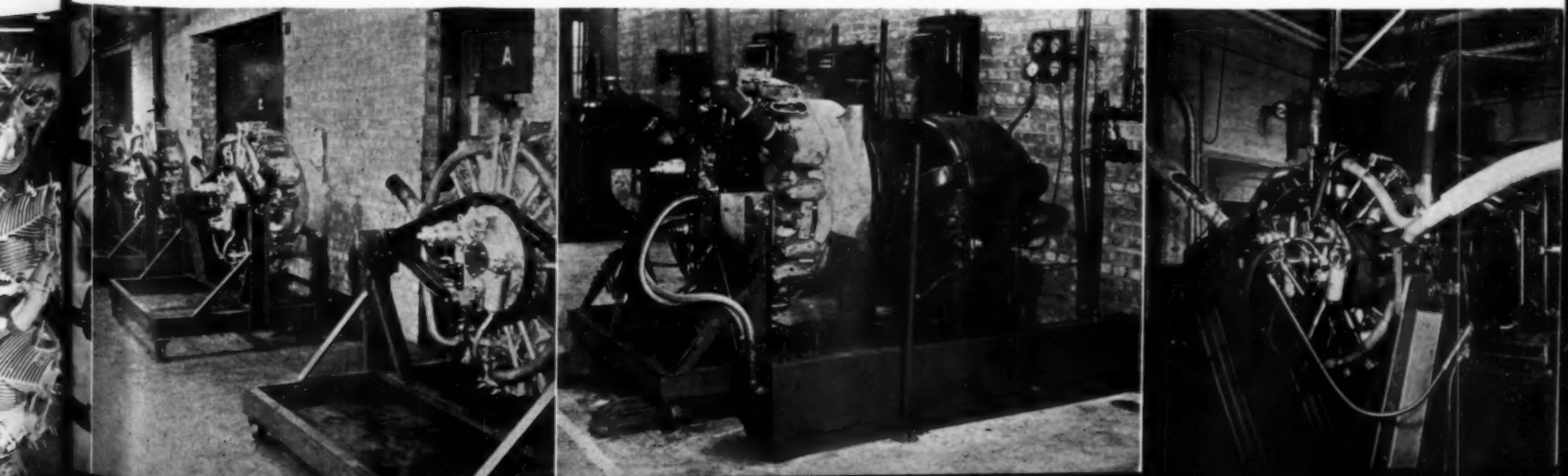
This portable rack carries the finished parts and sub-assemblies for a complete engine to the final assembly line.

-assembly is seen
Diesel near
s timing

Completed radial Diesels are lined up awaiting test.

Prior to testing the engines are "lapped in" for several hours on this motor stand.

Each engine is dynamometer tested for 5 or 6 hours, then disassembled, rebuilt, lapped in and final tested for 5 to 8 hours.





THE river towboat "W. W. Marting", launched on March 13 and placed into service a week later, is unique in many respects. It is the largest and most powerful towboat operating on the Illinois River. The "Marting" is owned by the Ohio River Company of Cincinnati, Ohio, and is presently engaged in barging coal to and from various points along the Illinois River.

The hull is all welded-steel construction and measures 154 feet by 34 feet by 10 feet with a normal draft of 6 feet 6 inches. Above the water-line, the forward end of the boat has four massive tow-knees which cause it to resemble other river towboats. Its construction below the water, however, is of a semi-model shape frequently referred to as a "modified scow". The stern of the boat is tunneled to house the two propellers and six rudders, four of which are backing rudders and two are steering rudders.

The superstructure, consisting of the engine room, captain's, and crews' quarters and the galley, is all a single story arrangement on the main deck so as to conserve head room. Another unique feature of construction and design is the unusually large pilot house, measuring 14 feet by 8 feet, which is raised and lowered on two hydraulic rams. For normal operation, the pilot house remains in the raised position, but it may be lowered by the supporting rams so as to pass under a bridge having only 16 feet of clearance above the water. Conditions requiring this clearance are encountered only on the Illinois River.

The main propulsion engines consist of two 6-cylinder, four-cycle, 16½" x 24½", 275 rpm., 800 hp. Busch-Sulzer, direct-reversing, marine type Diesel engines. At the aft end of each of the engines is a 21" Kingsbury thrust bearing

* Chief Engineer, St. Louis Shipbuilding and Steel Co.

through which the engine power is transmitted to the line shaft, tail shaft and propeller. The line shaft is 6¼ inches in diameter except for the lengths included in the bearings where the shaft diameter is increased to reduce the unit bearing stress. The tail shaft is 8½ inches in diameter and swings an 84-inch, 4-blade, cast steel propeller which was designed and made by the St. Louis Shipbuilding and Steel Company, builders of the boat. Years of boat building experience and close observation of the performance of river boats has resulted in the St. Louis Shipbuilding Company originating a propeller design which they feel is peculiarly adapted to river towboat service.

Another feature of the "W. W. Marting" is the auxiliary power system consisting of two Caterpillar Diesel-generator sets. The usual arrangement for auxiliary power on river boats is to have a small direct-current generator belted from the flywheel or line shaft behind the main engines. Such a generator is used to charge a large storage battery which acts as a reservoir for the electrical energy generated. The battery is charged or discharged according to the load variations in a manner similar to the storage battery on an automobile. When the above mentioned tail-shaft generators are used, it is customary to provide a small auxiliary engine-generator unit which is required to operate only when the main engines are idle for long periods. The "Marting" has relieved the main engines of this added load and has provided the two Caterpillar engine-generator sets, one of

Diesel River Boat

W. W. MARTING

By A. R. PARSONS*

which is required to operate at all times. These auxiliary engines sets consist of six-cylinder, 5¾" x 8", 900 rpm. Caterpillar D-13,000 Diesel units direct-connected to 55 kw. 125 volt, compound wound Westinghouse marine-type generators. Each engine and generator are mounted on a rigid iron base and constitutes a completely self-contained unit except for the cooling water which is taken from the main heat exchangers. The engine is equipped with air intake filters, fuel and lube oil filters, and an electric starting motor.

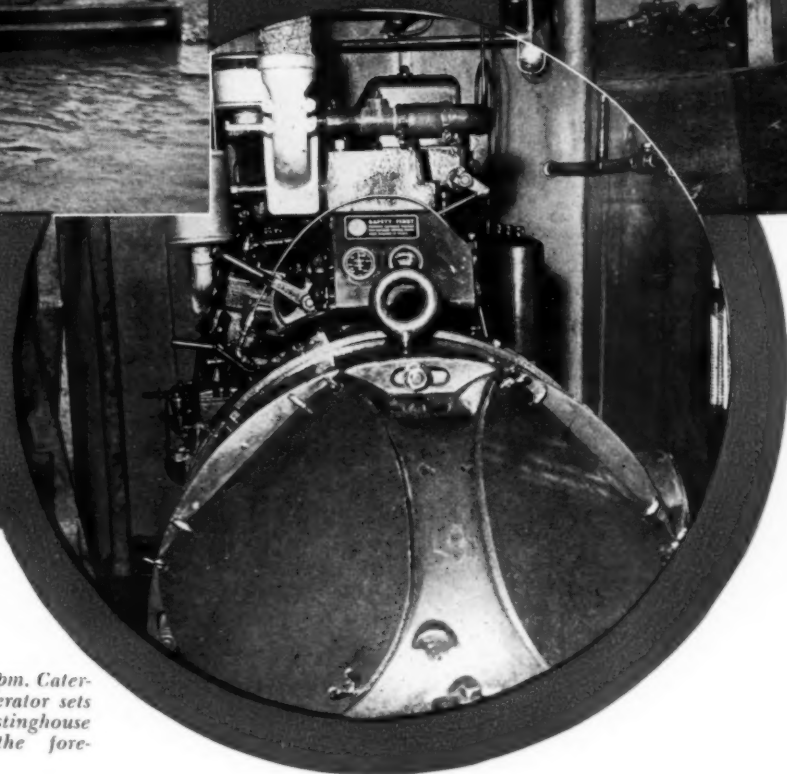
The importance of the role played by the Caterpillar Diesel engine-generator units is indicated by a glance at the following partial list of the equipment served by the auxiliary power system:

1. All lights throughout the entire boat.
2. Searchlights for night travel.
3. Raw cooling water pumps.
4. The fire pump, and the bilge pump.
5. Fuel transfer pump.
6. Electric refrigeration and numerous electrical cooking appliances in the galley.
7. The small domestic-type water systems furnishing drinking water, wash water, and sanitary service water for the toilets.
8. Lubricating oil transfer and filtration equipment.
9. Four electric driven winches.

Starting air for the main engines is available from two completely independent systems. The

One of the Caterpillar Diesel engine-generator sets mounted on a rigid iron base.

main systems, conditions, compressors, line shafts, propulsion, equipped, gage the, pounds pressure, consists of, designed, fitted with, safety, pop, pressor, starting air, during ex, the engine, The auxil, give the en, a part of, an emerge, its pressur, small moto, air into a s, This syste, ing pressur, compressor, electric mo



One of the 900 rpm. Caterpillar Diesel-generator sets with the Westinghouse generator in the foreground.

main system, used under normal operating conditions, consists of two 2-stage water-cooled compressors which are V-belt driven from the line shaft directly behind each of the main propulsion engines. These compressors are equipped with automatic clutches which disengage the drive when the air storage reaches 250 pounds per square inch. The air storage consists of six 30" x 96" welded steel air tanks designed for 250 pounds working pressure and fitted with the customary pressure gauges and safety pop valves. This system has ample compressor and storage capacity to supply the starting air requirements of both main engines during extended periods of maneuvering when the engines are started and stopped many times. The auxiliary starting air system was used to give the engines their initial start, and remains a part of the regular equipment to provide for an emergency should the main system ever lose its pressure. The auxiliary system consists of a small motor-driven compressor which discharges air into a single 20" x 60" welded steel air tank. This system is designed for 250 pounds working pressure, the same as the main system. The compressor is V-belt driven from a 7½ hp. electric motor which receives its power from

the Caterpillar generator units. Only a few minutes are required for this system to be brought up to pressure, and it provides sufficient air to start each main engine twice.

Fuel storage is arranged in a series of bunkers or compartments along both sides of the hull. These compartments occupy the space between the wing bulkheads and the hull and are directly under the walkways extending along either side of the superstructure. The fuel bunkers have a capacity of more than 150 tons of oil. In the laymen's language, this is 45,000 gallons—or sufficient fuel to operate both main engines and one of the auxiliary engines continuously at full rated load for more than eighteen days. Such a generous supply of fuel will permit the boat to continue operating until such a time as she can schedule a refueling while barges are loaded or unloaded.

A straight run mid-continent distillate is used as fuel for all four Diesel engines. The fuel is transferred from the storage compartments in the hold to day-tanks located on the upper engine-room floor. A small electric driven rotary pump is used to effect the fuel transfer.



Lower engine room view looking toward the forward end of the boat and showing one of the 800 hp. Busch-Sulzer Diesels.

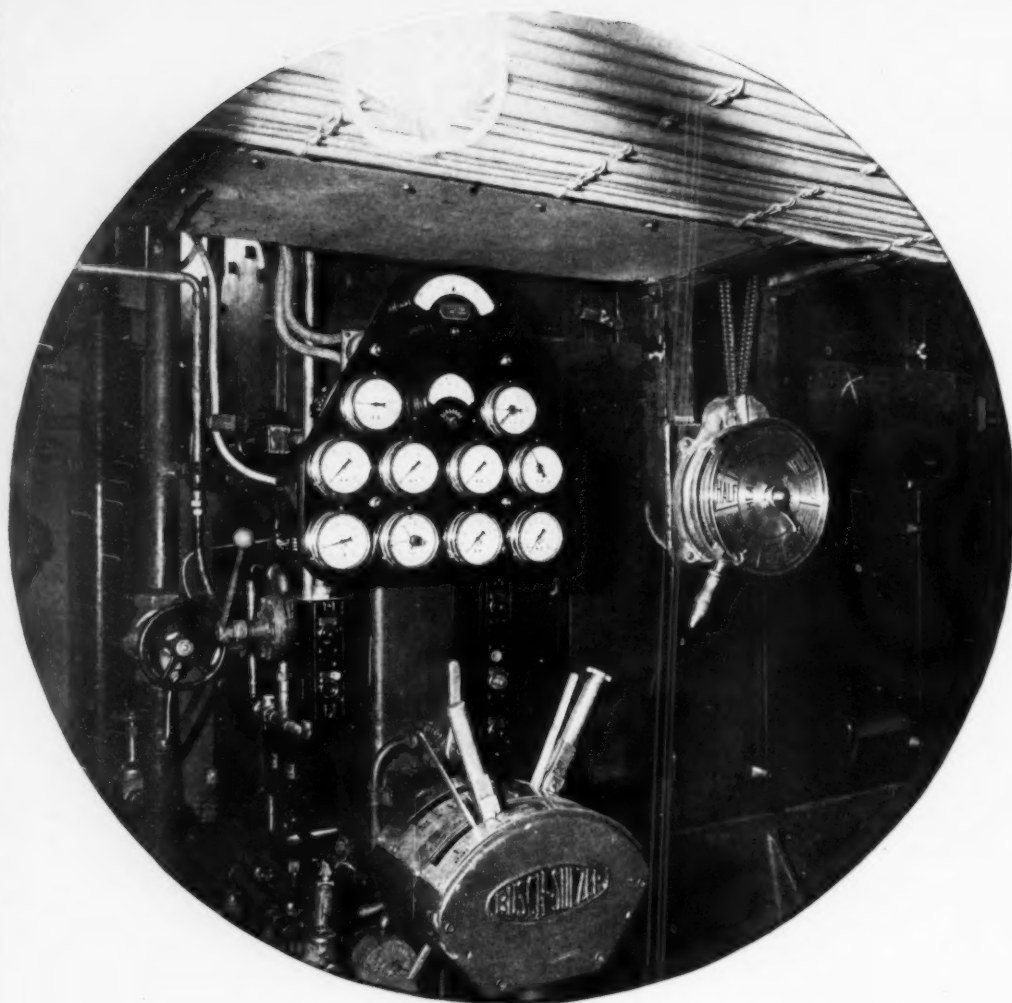
The fuel flows by gravity from the day-tanks to each engine where it is filtered before entering the fuel injection system.

Both the main engines and the auxiliary engines are cooled by an indirect cooling system. The river water is used for raw water. It is taken in through sea-cocks in the sides of the hull and is circulated through the shell-and-tube heat exchangers and returned to the river. Circulation is effected by motor driven centrifugal pumps, a separate pump being used for each exchanger. The soft water is circulated from the heat exchangers to each engine by built-in centrifugal pumps located on each engine. This arrangement is compact and precludes the possibility of the engineer failing to start a pump each time the engine is started.

On the main engines, the built-in pump delivers water to a header extending the full length of the engine. Water is supplied from this header to the base of each cylinder jacket and to the water-cooled exhaust manifold. The water outlet from each cylinder is fitted with a thermometer.

The engine air system consists of a three-cell dry cloth type filter for each of the Busch-Sulzer main engines. The filters are located on top of the engine room, and the air is conducted down to the engines through welded steel ducts. In general, the system is short, simple, and quite accessible for service.

The exhaust gases from each main engine are carried upward from the aft end of the engine through an exhaust silencer located in the upper engine room. A pyrometer is located on the control board of each engine and is connected to thermocouples in the exhaust fitting of each cylinder.



The control end of one of the Busch-Sulzer Diesels. The Weston tachometer is the top center instrument with Alnor pyrometer directly under it.

Each of the auxiliary engines is equipped with a viscous-impingement type of air filter mounted directly on the intake manifold. These engines do not take air from the outside, but take their air from the forward engine room hold in which they are located. The exhaust gases are passed through exhaust silencers supported in a horizontal position against the main engine room ceiling.

There is a hydraulic system which is used to operate the steering rudders, backing rudders, and the rams which raise and lower the pilot house. A light grade of lubricating oil is used as the hydraulic medium, and it is maintained at a pressure of 300 pounds per square inch by means of gear-type pumps. There are three of these gear-type pumps, two of these are V-belt driven from the main line shafts behind each engine, and the third is motor driven and operates only when the oil pressure falls below a predetermined pressure.

In steering the boat, the pilot shifts the steering lever to the desired rudder position. The

lever opens the valves to the steering ram, admitting the high pressure oil which moves the ram. The ram is connected to the rudders, hence the actual work required in moving the rudders is performed by the hydraulic oil. A unique feature of the steering mechanism is the "electric follow-up" which closes the valves controlling the oil flow to the ram when the rudder has reached a position coinciding with the direction indicated by the steering lever. For example, if the pilot shifts the steering lever to a point 15 degrees to port, the valves open and admit oil to the ram. The ram turns the steering rudders to the port side. As the rudders reach the position, however, where they are pointing 15 degrees to the port side, coinciding with the lever direction, the "follow-up" closes the valves. This holds the rudder in the position indicated by the lever until the lever is moved to another position.

There are several other pieces of mechanical equipment on the boat which are worthy of mention. For making up tows, there are four electrically driven winches or capstans on deck.

There are two such capstans on the forward deck, each powered with a 10 hp. motor; and there is a capstan on each side of the boat having a 5 hp. motor. A small crane with an adjustable boom is located on the rear deck. It is used for lifting the landing boat or pieces of equipment weighing up to two tons.

Several pumps are required for the various services on the boat, and these pumps are located in the lower engine room and the hold aft of the engine room. There is a 100 gpm. fire pump, driven by a 15 hp. motor and delivering water at 254 feet of head, which supplies water to the fire hoses on either side deck. This equipment is used in case of fire, and is also used to wash the decks. A small electric driven bilge and ballast pump is connected to the lowest points of the various compartments and is used to dispose of water collecting in the hold and to trim the boat.

The domestic water systems consist of small single-cylinder double-acting reciprocating pumps, V-belt driven by fractional horsepower motors, and maintaining pressure on supply tanks serving the various water systems aboard the boat. The smallest of these units is powered by a 1/6 hp. motor and maintains pressure on a 40 gallon tank furnishing the drinking water to numerous points throughout the boat. The two larger units employ 1/4 hp. motors and 75 gallon pressure tanks, and furnish the wash water and the sanitary service water.

An oil-fired steam-heating boiler is used to heat the living quarters and pilot house. The boiler is located in the engine room, and the oil burner uses the Diesel fuel oil. The galley stove also uses this oil for heating purposes.

The entire boat is finished and equipped in good taste. A color scheme of apple-green with white trim is used throughout the living quarters. The galley is finished in white with Monel metal sink and drain board, and is equipped with modern electrical cooking appliances. And the laundry room with its electric washing machine and electric iron and mangle is another piece of evidence that the boat is modern.

The equipment on the "W. W. Marting" includes air filters by American Air Filter Company; exhaust silencers by Maxim; pyrometers by Alnor; air compressors by Gardner-Denver; lubricating and fuel oil by Shell; fuel oil filters by Purolator; oil coolers by Ross Heater; lubricating oil reclaimers by Hilco; hydraulic pumps by Tuthill; tachometers by Weston.

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Part of a fleet of twenty-two Diesel lumber trucks en route from Pontiac, Michigan to Westwood, California.

PAUL BUNYAN'S PINE

EVEN Paul Bunyan, the mythical giant of the lumber world, would stop to stare at the impressive fleet of massive GMC Diesel lumber trucks which are en route from the General Motors Truck and Coach factory at Pontiac, Michigan, to Westwood, California, where they will be put to work by Red River Lumber Co.

This fleet of twenty-two General Motors Trucks, all powered by the General Motors six-cylinder, two-cycle Diesel engine, is a far cry from the crude hauling equipment in use during the legendary Paul Bunyan days, when "Babe," Paul's colorful blue ox, was called upon to do most of the transportation work. These huge trucks will be called upon to do extremely rugged work by the Red River Lumber Company, which, incidentally, uses the term, "Paul Bunyan's Pine," as a trade name.

These Diesel trucks haul loads running as high as 75,000 pounds over 30 miles of so-called "Company" road and over rough stretches where there is no road at all. The fleet, largest of its kind yet delivered to a lumber concern, will supply logs for the 200-million-foot mills of the Red River Lumber Company.



A typical load for these sturdy Diesel trucks, three huge pine logs.



Five Diesel trucks in the fleet operated by Land O'Lakes Company of Minneapolis.



This Diesel motor is making a "Pump" record for Dodge's Diesel of Minneapolis.

DIESEL TRUCKS CUT COSTS

A Comparison of Gasoline and Diesel Truck Operating Costs.

Editor's Note:—This article is condensed from a paper, based on detailed analysis of the cost records of several fleet operations, by L. T. Knocke, Diesel Engineer, Chrysler Corporation.

FOLLOWING more than a decade of design and laboratory research with the Dodge-Diesel engine, the Chrysler engineering staff went out into the field and gathered first-hand information from the experience of actual owners and operators which throws considerable light on the subject of Diesel performance in the field of truck transportation.

Before getting down to cases, it is noted that the prime factor, that led to creation of the vast trucking industry as we know it today, was economy. Operators sought economies both in operating cost and delivery time because practically all other factors, such as cost of equipment, labor, fuel and lube, maintenance, licensing and other taxation entering into the total cost, were virtually fixed. Of these factors, experience has shown that fuel and maintenance were the most vulnerable and the following reports of field operations show how and why Diesels have come into their own in the attack on these two worrisome items. Following are

brief descriptions of several large trucking operations together with cost comparisons between Diesel and gasoline trucks in service under identical conditions.

The Hillside Garage and Transit Company of Milwaukee, Wisconsin, hauls foodstuffs for all the stores of a leading chain grocer throughout Wisconsin and the Upper Peninsula of Michigan. Included in its vast fleet are four Dodge-Diesel tractors. Its trucks are on the job day and night, making deliveries in the small hours of the morning as well as late at night. Loads carried in its vast semi-trailers come to its warehouse, not in small parcels, but in 18,000 to 20,000 pound shipments.

From cost operating records kept by this concern, we find that the mileages for both the Diesel and gasoline powered tractors is approximately the same and that the average cost per 1,000 miles for the Diesels is \$18.92 as compared with an average of \$40.13 for the gasoline powered tractors.

Comparison of maintenance costs of the same three Diesel and gasoline powered tractors show the average for the Diesels was \$4.63 as compared with \$2.14 for the gasoline powered vehicles. Total costs per 1,000 miles for the

Diesels, however, averaged \$40.32 compared with \$56.22 for the gasoline powered tractors—a saving per 1,000 miles of \$15.90 with the Diesel equipped vehicles.

It is noted that the fuel and lubricating oil cost of Diesel trucks is less than one-half that for gasoline trucks; that depreciation and repairs are slightly higher for the Diesel but that the total overall saving to be obtained with the Diesel truck is about \$3,180 for the 200,000 mile life expectancy of the vehicle.

The lesser number of hours per trip required with the Diesel has not been mentioned since, with regard to actual economy, it may appear unjustified, as many operators pay their drivers on a per mile basis. It does, however, permit more use of the equipment and in some cases does perform complete trips without labor interchange—which otherwise could not be done under statutory limitations of permissible hours. Furthermore, the combined weight of the load, the semi-trailer and the tractor averages 32,000 pounds and the Diesels have been given the tougher trips with the heaviest loads, so we are sure of the savings quoted.

Now let us consider the operation of the Express Freight Lines of Milwaukee, Wisconsin.

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This line hauls general freight between Milwaukee, South Bend and Detroit on a 24-hour year 'round schedule.

The Dodge-Diesel tractor operated by this concern was purchased on October 15, 1939, and now has over 88,000 miles of operation. The average fuel consumption is 9.4 miles per gallon, as compared to 6.15 miles per gallon for a similar operation with a comparable gasoline powered vehicle. This unit is equipped with a two-speed axle and hauls loads in excess of 12 tons. The saving on fuel for one year over a gasoline job was approximately \$1,200. This engine was overhauled at 60,000 miles and new pistons and rings installed. Bores were not reconditioned, as they were in perfect shape. Note in the chart below the high fuel mileage of the Diesel as compared to the gas engined truck.

Truck	Comparable	
	Dodge Diesel	Gasoline Truck
Miles Traveled	800	800
Gallons Fuel Used	85	130
Miles per Gallon	9.4	6.15

A truck owned by the Service Transfer and Storage Company of La Crosse, Wisconsin, furnished another interesting example of Dodge
..... Now please turn to page



In heavy freight service, this Diesel truck has covered over 160,000 miles.



This Diesel truck covers 120,000 miles a year.



South Bend, and Detroit.





"Judy"—a new 32' Diesel cruiser owned by R. K. Ottesen of Freehold, N. J., and powered with a Mack Mariner type Y engine. The compact power plant leaves space for an exceptionally large cabin.

DIESEL WORK BOATS AND PLEASURE CRAFT

By GEORGE D. CROSSLEY

MOST of the craft illustrated on these two pages have been converted from gasoline to Diesel propulsion within the last two years. By comparison with former operating costs, each of these vessels has already shown remarkable savings. All are powered with Mack Mariner Diesels using the Lanova combustion system. The work boats are fitted with type W engines and the pleasure craft with type Y, the work type engines being conservatively rated for continuous, sustained duty. The distinguishing feature of the type W Mack Diesel is that the flywheel is located at the propeller shaft coupling end where it takes up clutch and propeller shocks which are more severe in work boats. Otherwise, the two engine types are similar in that a dual closed fresh water cooling system with built-in heat exchanger is employed, filters for both fuel and lube are attached, and complete pressure lubrication is provided. The widely known Lanova combustion system is an inherent feature of Mack Diesels, whereby the engines develop their high power output with moderate compression and fuel injection pressures with corresponding low bearing pressures and smooth, quiet performance. Typical of the rapidly growing list of Diesel vessels both new and converted, these vessels are giving their owners new experiences in Diesel economy, safety and availability.

"O'Brien Service," a 39 year old tug was repowered a year ago with a Mack, work type Diesel, driving the propeller through a 3:1 reduction gear and powering the winch, generator, air compressor and pump through a power take-off.



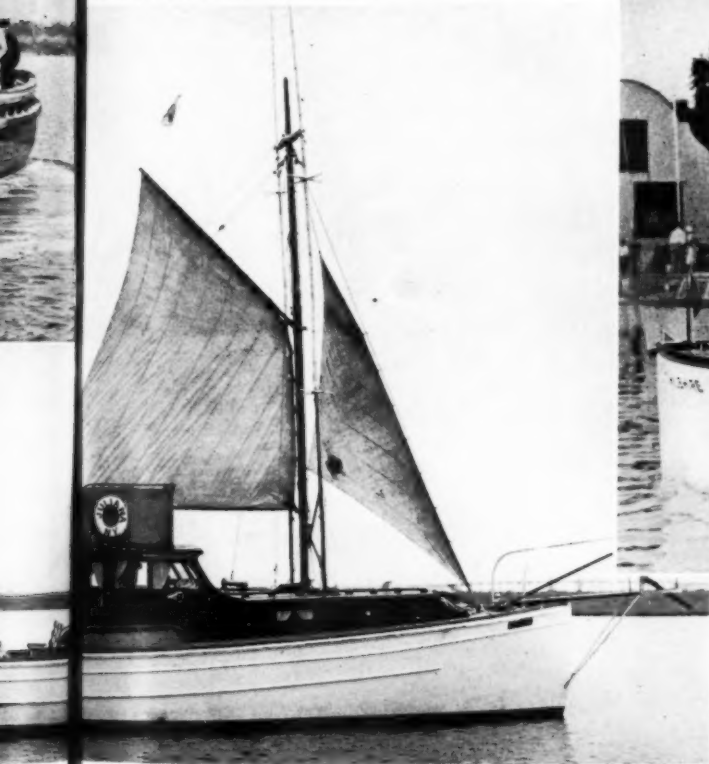
"Colonel"—a freighter, making money for her owner Joseph Jetts, Jr., hauling coal and cement between Norfolk, Va., and Baltimore, Md. She is powered with a Mack type W, 100 hp. marine Diesel.

The "Juliana" is a 42' sport fisherman belonging to Joseph Schlesinger of Freeport, L. I. Converted from gasoline to Diesel propulsion in 1939, she makes 14 mph. maximum and consumes 3 gal. of fuel oil per hour as compared to 5 gal. of gasoline per hour previously used.





This party fishing boat accommodates up to fifty persons on trips off Sandy Hook, L. I. Built in 1938 with gasoline power, she was converted to Diesel with a Mack Mariner Type W engine in September, 1939. Her fuel consumption was cut in half.



This private sport fisherman was built in June, 1940, by the New Brunswick (N.J.) Boat Works for Sophie Twardus of Brielle, N. J. The "Milshire" carries a Mack Mariner, Type Y, Diesel for power.



This fast cruiser from Manchester, Mass., was originally powered with two 175 hp. gasoline engines. In June, 1940, she was converted with twin Mack Mariner yacht type Diesels to reduce fuel consumption by one-half. She is a 68 footer and makes 14-15 mph.

INSTALLATION of Worthington angle compressor gas engines in the new butane standby plant at the turn of the year marked the culmination of the ambitious municipal ownership plan began in 1922 by the City of Long Beach. Located in the southern part of the Golden State near the center of the most prolific natural gas area of the Los Angeles basin, it would appear there would be no shortage of natural gas for local consumption. This is not the case, however, due to most of the field being under contract to private utilities. Since December, 1926, it has been necessary for the City to enter into various contracts with outside interests for delivery by pipe line of gas from the Ventura field.

Under the terms of the 1940 contract with the wholesale gas company, the City paid 20 cents per M.c.f. for all gas delivered plus a standby charge of \$192,000 for the 12-month period, an average of \$16,000 a month whether or not the City required any deliveries. A clause in the contract provided for seven cents of the twenty cents paid to be credited on the standby charge for that month. Regardless of this credit on

the standby charge, the City paid the wholesaler a total of \$218,117.97 for 222,744,000 cu. ft., or \$.979 per M.c.f., a record high.

During 1940, the City Gas Department engineering force made an exhaustive study of the rising cost of serving 197,000 persons through 54,822 domestic meters. On August 24, 1940, the City Council authorized the construction of a liquefied petroleum gas-air mix plant adjacent to the City's main Diesel compressor plant north of Signal Hill.

Two Worthington, 8 cylinder, 300 hp. each at 350 rpm., angle compressor engines equipped for natural gas operation were selected to power the new \$240,000 plant. Engine cylinders are 11½" x 12" and the compressor cylinders, four to an engine, are 15" x 12" rated 125,000 cu. ft. per hour each at 50 lbs. gauge maximum working pressure. Engines are air starting and centrifugal governor controlled; lube oil is filtered and engine equipment includes pressure gauge, thermometer, pressure and temperature alarm, intake air filters and exhaust silencers. No heat exchangers or cooling tower

are necessary, the circulating system being directly connected to the cushioning water reservoir at the base of the telescoping gas storage tank of the City's main gas supply.

This is the largest plant of its type in the world having a production capacity of equivalent to 500,000 cu. ft. of natural gas at 1070 Btu. per hour. With the exception of starting and stopping, the operation of the plant is entirely automatic. This automatic operation is accomplished by combination speed and capacity control to keep pressure constant within two pounds of the specified pressure. In practice, it operates like this:

When the pressure rises in excess of the two pounds tolerance, automatically the engine rpm's are cut, if necessary, to as low as 170, or idling speed. If pressure continues to increase, Number 1 and 2 cylinders are unloaded on the

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LONG BEACH, CALIFORNIA

By JIM MEDFORD



head end by bypassing. Speed control again takes over. If pressure continues to go up, cylinders 3 and 4 similarly unload—again the speed control takes over. The fact that there are two units, both arranged like this, creates the unusual interest inasmuch as they are synchronized, so that total plant pressure remains at not more than two pounds variance from specified pressure regardless of load. And, as a safety measure for extremely light loads, the entire pressure is automatically unloaded, the engines idling at 50% speed until a pressure drop due to additional demand in the meter supply line commands that speed control again take over.

Engine performance and line conditions are indicated and recorded on the various instruments mounted in the dead-front automatic control board at the end of the engine room. These include: ratio flow controllers, indicating pressure gauge, and specific gravity recorder. Housed in a separate cabinet is a recording calorimeter to check on the board's specific gravity recorder.

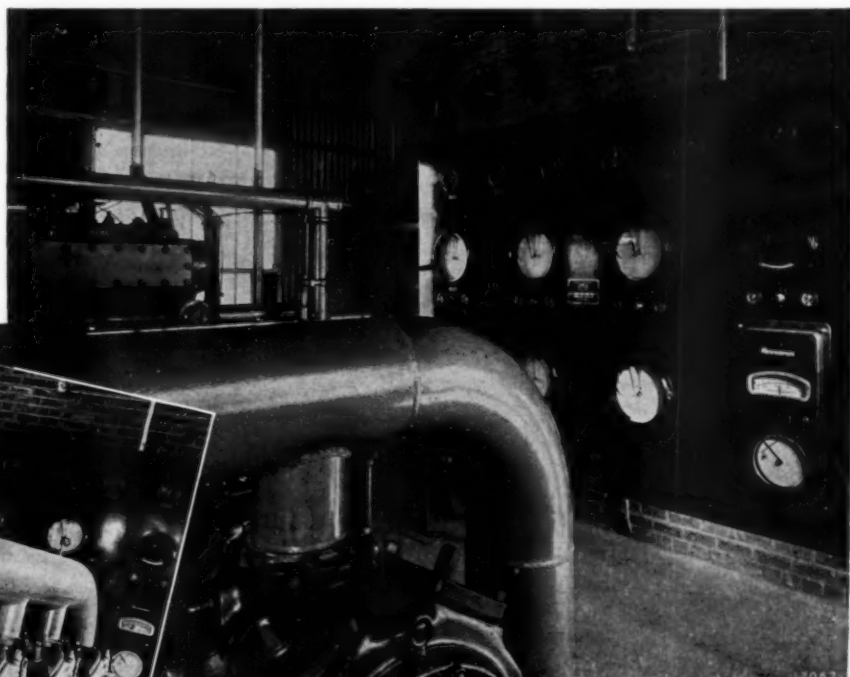
In addition to the compressor units, the plant building houses three 50 hp. kinetic steam generators of the flash type. Operating automatically, like all equipment, they take care of the fluctuations in heat demand in the

vaporizer. They are equipped with hot wells, and a full steam pressure head is available within five minutes.

The main compressor plant for the City was located on its present site in 1927, consolidating several smaller units scattered throughout the area. It consists of twelve Western horizontal Diesels of 160 hp. belt-driving a like number of Ingersoll-Rand compressors of 80,000 cu. ft. per hour capacity each at 30 lbs. pressure, giving the plant a total of 800,000 cu. ft. consumers workable capacity.

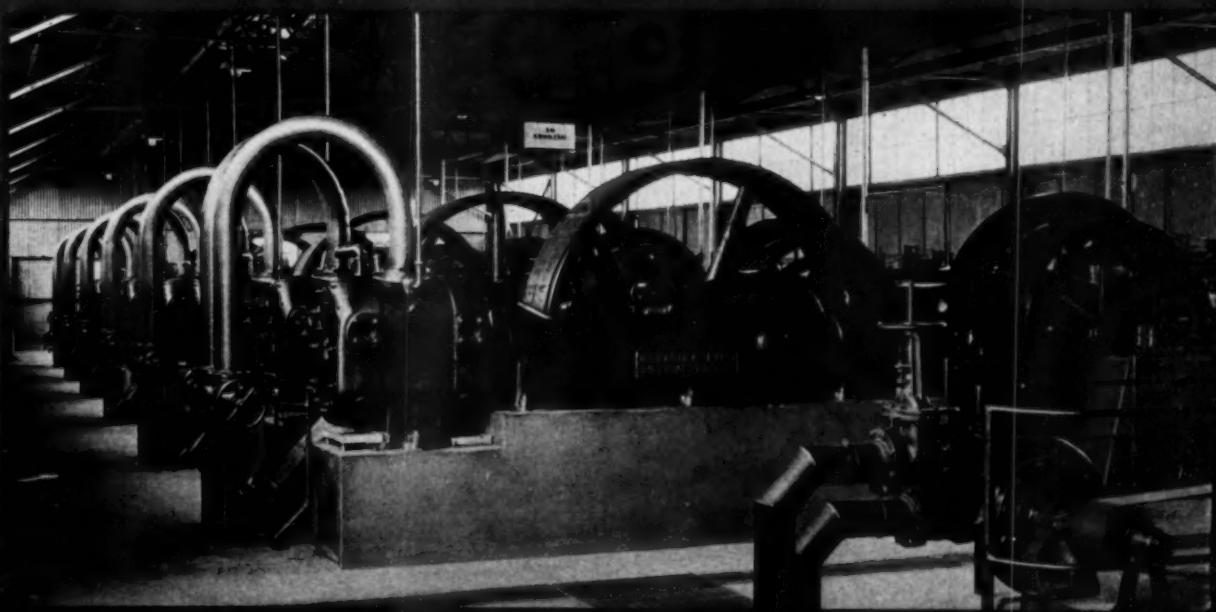
Due to the generally mild weather since the standby plant's completion, except for test the plant has been inoperative. But based on the elimination of the \$192,000 standby charge alone, the plant's total cost of \$240,000 will be charged off within fifteen months. To the municipalities faced with a problem similar to this of the City of Long Beach, here is conclusive evidence of the cost-saving made possible by proper application of the economy principles of natural gas or fuel oil Diesel prime movers.

Credit for the efficient engineering and construction of this modern plant is due Harold W. Wickstrom, Consulting Engineer, of Los Angeles; Edwin S. Bryant, Assistant Superintendent, Long Beach Gas Department; and M. A. Nishkian, Chief Engineer, Oil Field Construction Co., Long Beach, who made the installation. Engine and plant accessory equipment includes: governors by Pickering; exhaust silencers by Maxim; intake air filters by Vortex; lube oil (Cyclo) by Associated Oil Co.; lube oil filters by Cuno; oil pressure alarms by Minneapolis-Honeywell; gauges and thermometer by Tagleblue; flow controllers by Fisher; specific gravity recorder by Ranarfox; valves by Merco Nordstrom; calorimeter by Cutler-Hammer; and steam generators by Kerrick.



Lower left: Liquefied Petroleum Gas Air-Mix standby plant showing the 500,000 gal. butane storage tanks and engine house. Left: Compressor end of the two Worthington angle type compressor engine operating on natural gas. Above: Control board.

Six of the twelve Western Diesel and Ingersoll-Rand compressor units of the Long Beach Gas Department.



IRA S. Bushey & Sons of Brooklyn, N. Y., has just completed two outstanding tugs which give ample promise of maintaining the Bushey reputation for excellence in tugboat design and construction. These latest products of Bushey's boards and yard are the *Consultor II* and the *Crusader II*, identical in every detail. The *Consultor II*, first to be completed, has already left for oil barge service on the Great Lakes, to be followed shortly by her sister ship.

These are attractive 100 footers, having a 25' beam and 12½' depth, and finished in a rich buff, trimmed in green, with scarlet coating on the inside of the ventilators. They are of typical Bushey electric welded steel construction and have 3-blade bronze propellers designed by Ira S. Bushey & Sons and cast by Ferguson.

The power equipment is a Fairbanks-Morse marine Diesel rated 805 hp. at 300 rpm., 7 cylinder, 14" stroke, 17" bore. The spacious lower engine room is well worth a careful examination. The main engine is of the 2-cycle, airless injection, direct drive, direct reversible type, fitted with oil cooled pistons, open head combustion, differential injection valves, back-flow scavenging and twin Nugent fuel oil strainers. The 20 kw. Electro Dynamic, 125 volt D.C. tailshaft generator is driven off the main engine flywheel through a V-belt drive.

The marine Diesel auxiliary set consists of a 2-cylinder, 4¼" bore, 6" stroke, 20 hp., 1200 rpm., Fairbanks-Morse marine Diesel, with De Luxe lube oil filters, clutch connected to a Northern 150 gpm. rotary pump, clutch connected through a Link Belt speed reducer to a Gardner-Denver 43 cfm., 2 stage, water cooled duplex air compressor, all mounted on a common sub-base. The 4 cylinder, F-M, 4¼" bore, 6" stroke marine Diesel engine, rated 32 hp. at 1200 rpm. fitted with De Luxe lube oil filters, and the 20 kw. generator, which make up the auxiliary generating set, are also mounted on a common steel sub-base. Detroit Lubricator thermostatic safety control switches are fitted to the jacket cooling water systems of both the main and the two auxiliary Diesels.

A full set of Edison 56 cell batteries for ship service, as well as Youngstown Miller oil purifier equipment, is found in the lower engine room. Maxim Silencer equipment is on both main and auxiliary engines for the tugs.

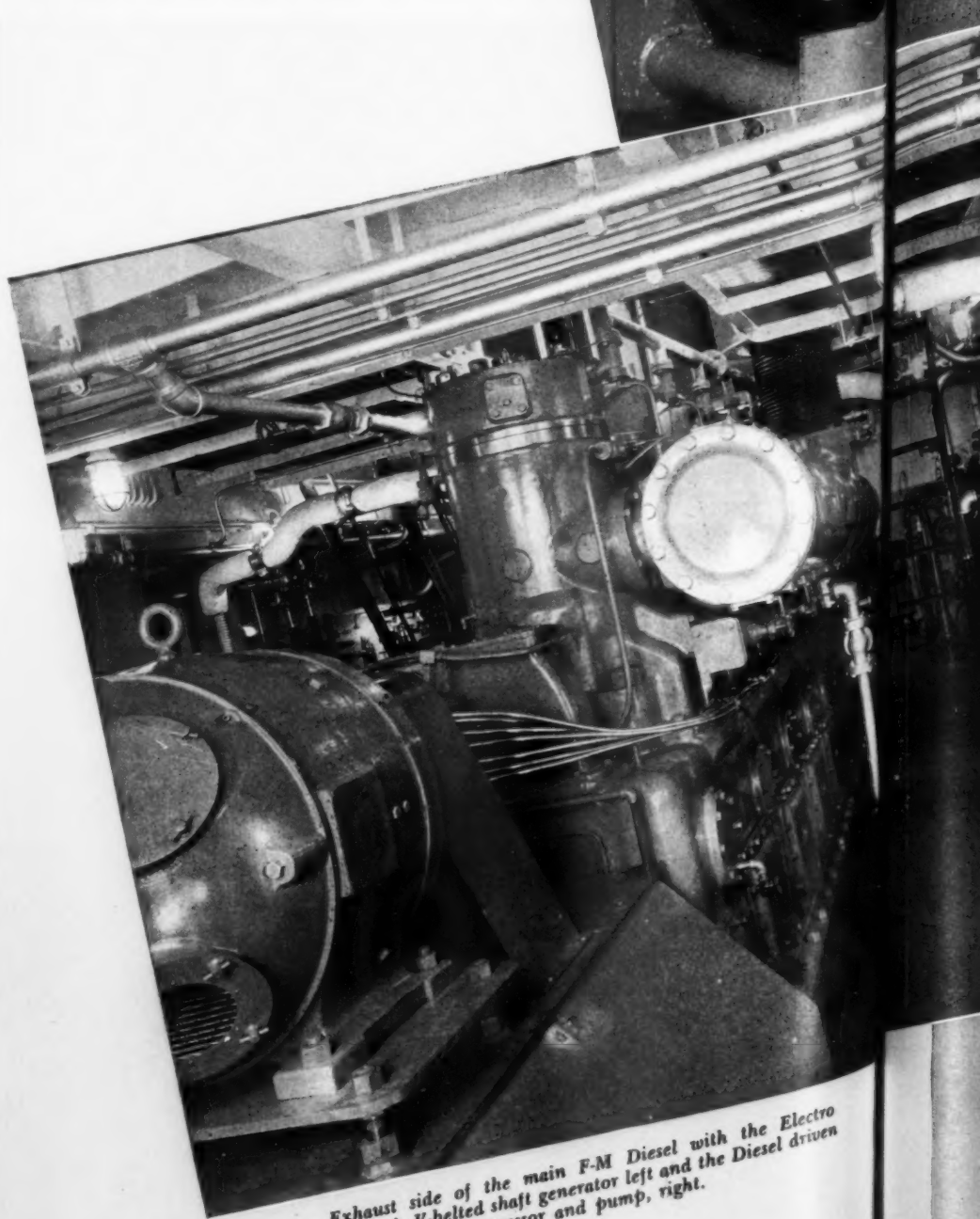
In the upper engine room, plenty of operating space and the judicious use of it is apparent. On the instrument panel are seen the Weston tachometer, the Seth-Thomas time clock and

"CONSULTOR II"

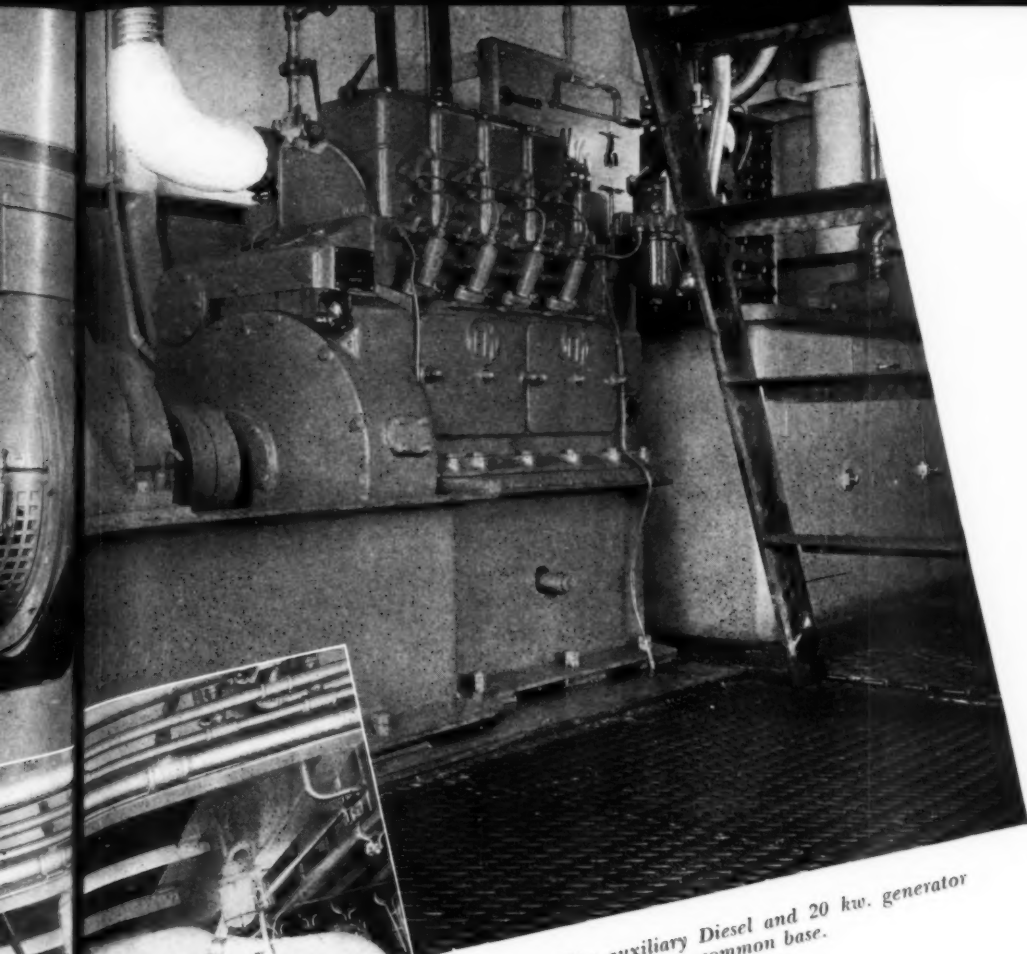
AND

"CRUSADER II"

By WILL H. FULLERTON



Exhaust side of the main F-M Diesel with the Electro Dynamic V-belted shaft generator left and the Diesel driven auxiliary air compressor and pump, right.



The auxiliary Diesel and 20 kw. generator mounted on a common base.

the air and oil pressure gauges by Consolidated Ashcroft Gauge Company.

The electrical control panels throughout the boat were built by Smith-Meeker Engineering Company of New York City, utilizing, as usual, the suggestions of Ira S. Bushey & Sons. In the upper engine room, as throughout the boat,

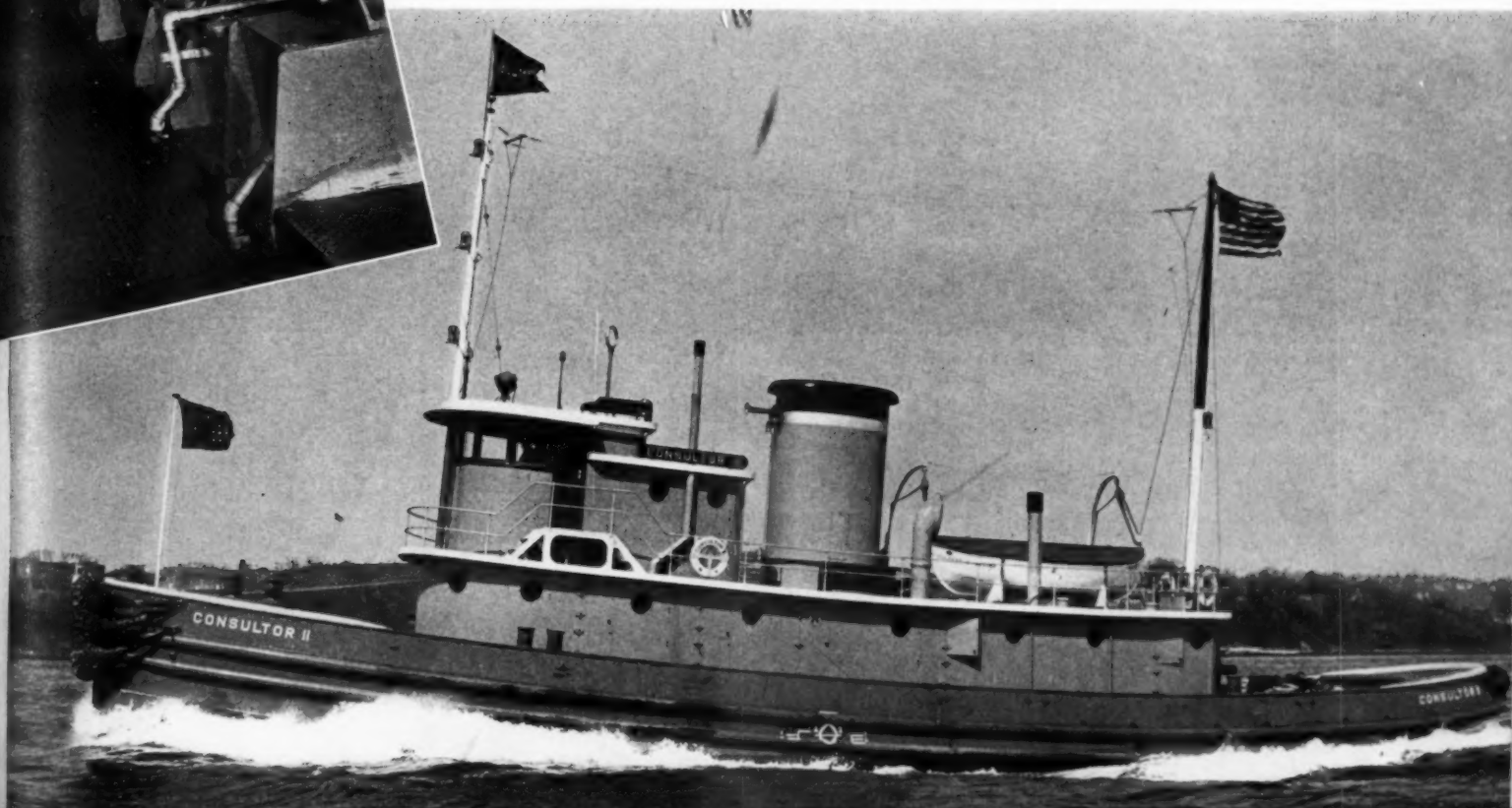
Johns-Manville acoustical veneer, backed by their superfelt on the walls and ceilings, is used for sound proofing. Also, in all quarters, are flush mounted lighting fixtures and moisture proof wiring.

Moving to the pilot house, we see the same general layout that typifies other Bushey tugs. A Bludworth Signal Arrow direction finder is there, as is the Seth Thomas clock, the Weston tachometer and the pedestal, brass binnacle and spiral compass furnished by Negus. Johns-Manville sound-proofing equipment and Dex-o-tex floor covering are two additional items found here, as elsewhere throughout the tug.

Aft of the pilot house and finished in a light grey stain, the color theme used in the interiors of the *Consultor II* and the *Crusader II*, are the Captain's quarters with an individual berth and ample drawer space beneath. Luxurious appointments are found throughout the rooms, including the Western Electric radio-telephone.

To the dyed-in-the-wool old timer in the tugboat field, probably nothing comes as a bigger shock than the luxurious crew accommodations on board the Bushey tugs. There are four rooms on both of these tugs, with accommodations for eight men, each room containing two solid maple berths with drawers beneath, and boasting of the finest in mattresses and linen. There is ample locker space, wash bowl with hot and cold running water, medicine cabinet, electric fan, ceiling light, Pullman berth lights and a steam radiator with mushroom ventilator.

First completed of two identical tugs, the "Consultor II" on trial run.

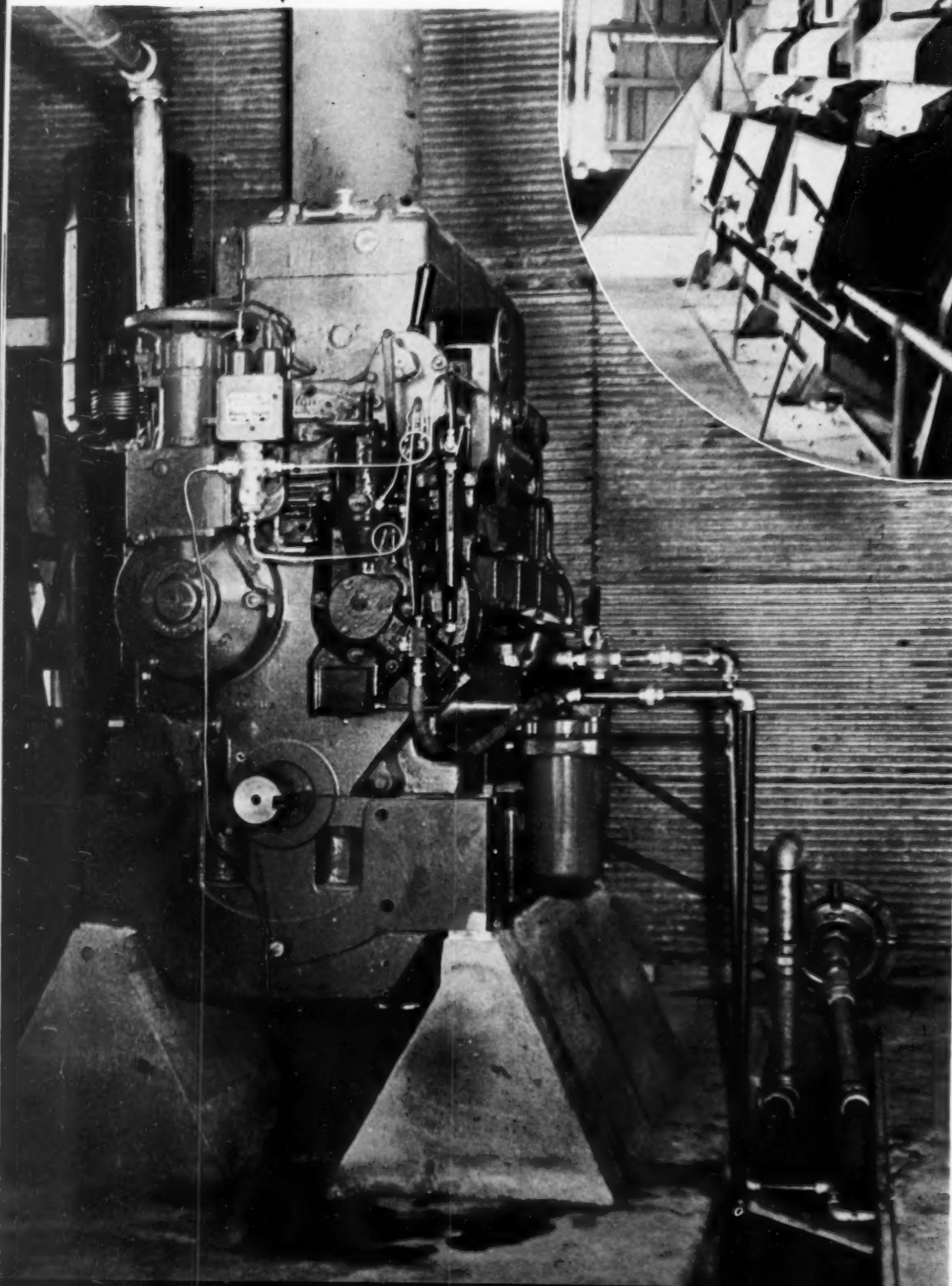
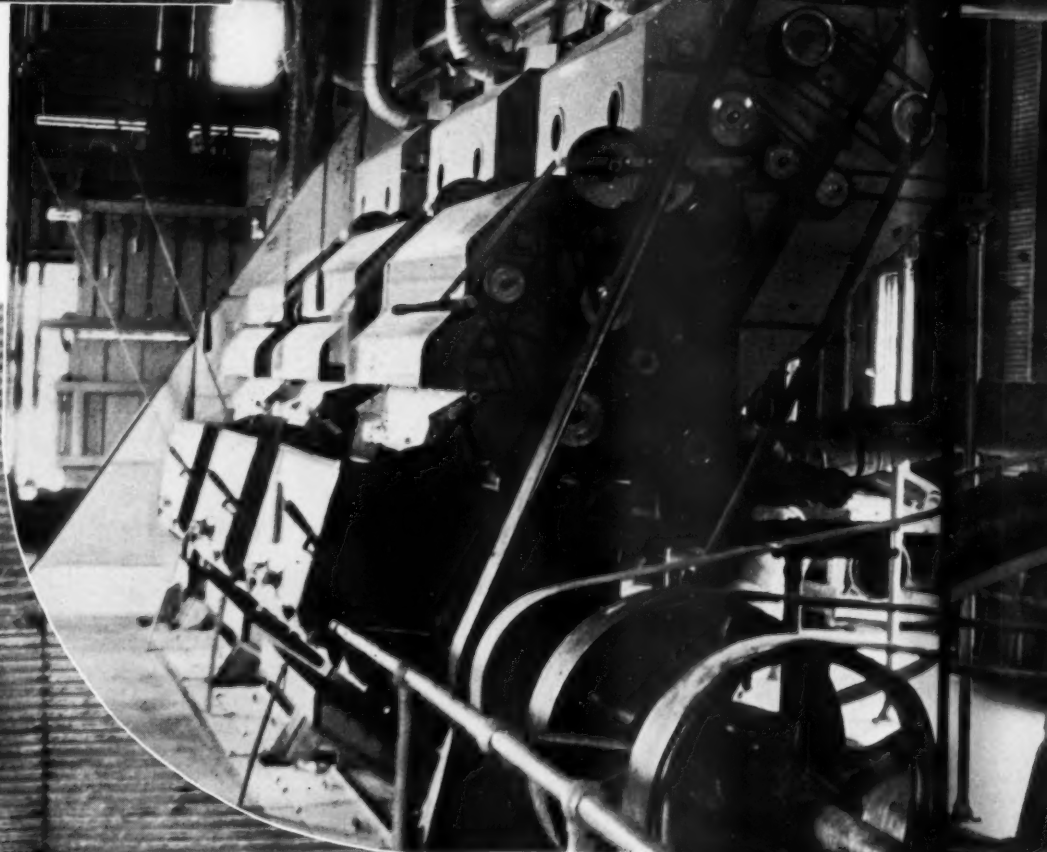




↑ Seen at the extreme right
are the power house wing
and Diesel cooling tower.

View of the cotton gin
looking from the engine
room. →

This Cummins Diesel de-
velops the power required
to operate the gin continu-
ously during the ginning
season. ↓



COTTON

WITH

By GEORGE B. BAKER



A PRIMARY field of application for the Diesel Engine is the cotton ginning industry, with its more than 15,000 operating units in the United States and several thousand units in foreign countries. Typical of such installations in this industry are the Trailback Gin Company's two installations on the Trailback Plantation, near Essex, Missouri. At Essex, the gin is powered by a Cummins Diesel, operating at 700 rpm., pulling a three stand, 80-Saw Murray gin and all the necessary ginning equipment incident to a modern outfit. The ginning machinery has been in use four years.

The ginning season starts in the early fall, and is continued well into the winter months in many cases. Ginning usually starts off slowly about the last of August or the first of September. In two or three weeks many gins are operating twenty-four hours per day for two or three months, tapering off to a few hours a day by the end of December. The need of a flexible and reliable power source for ginning is evident.

During the last ginning season the engine in this gin had to operate ninety days continuously, except for being shut down a few minutes weekly to change lubricating oil. The fuel cost per bale for the past two seasons has averaged around 10 cents per bale, a reduction of 50 per cent as compared with previous cost with another engine. During the first season, this gin made a record for quality production from a 3-80 Saw outfit. A total of 4,960 oversize bales, equalling 6,000 standard 500 lb. bales, was ginned. The capacity of a gin of this size is 96 500-lb. bales per day, if the cotton is dry and in proper condition, while the minimum production from wet cotton is around 65 bales per day. The average production is then four 500-lb. bales per hour. The Trailback plantation is owned and managed by Mr. S. M. Barton, and comprises 3,000 acres of cotton land. An additional 10,000 acres is overseen and operated by the management, and all the labor is hired. The plantation purchases practically all of the cotton processed, three-fourths of the cotton ginned being custom work. Since an average of 80 bales a day is lost if there is a breakdown due to power trouble, or mechanical breakdown, the cost for lost time would amount to around \$480 for each day the plant is idle.

This installation also includes modern and complete auxiliary equipment, comprising a standard air starting system, a Maxim silencer, variable speed governor, Fulton Sylphon safety controls, and a Marley cooling tower. The routine maintenance consists simply of changing

of the lubricating oil filter bags. This engine started operation September 1, 1939.

At the start of the 1940 fall ginning season, Mr. Barton put a new gin into operation at Morehouse, Missouri. This outfit is larger than the Essex plant, being a 4-80 saw gin, and powered by the same model Cummins Diesel as is used on the three stand gin at the Trailback plantation.

The cooling system is the closed type. The cooling water flows through a 55-gallon expansion tank and then through a heat exchanger in the engine room. The exchanger water is cooled by the water tower set up at the rear of the gin. The water is circulated by a 1½" Gardner-Denver centrifugal pump driven from the front of the engine.

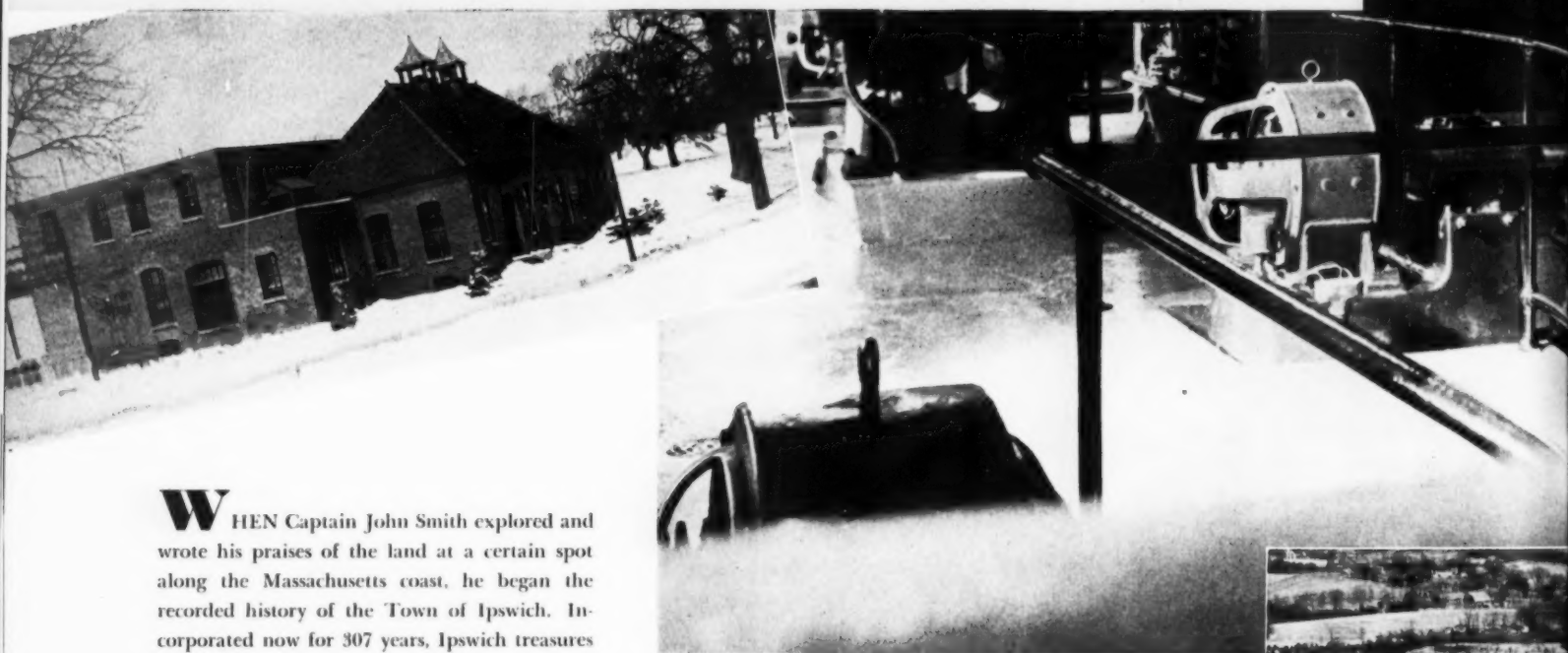
The engine drives a 2 15/16" line shaft approximately 20' long through a clutch power take-off. The shaft is connected to the power take-off with a Falk flexible coupling. The shaft is supported 26 inches above the floor on five pedestal bearings, SKF type. The following equipment and drives, typical of a first floor ginning installation, illustrates the machinery involved. There are seven pulleys required to drive the gin equipment from the line shaft. A pulley 7½" dia. with an 8" belt and 12' centers to a 6½" pulley drive the dryer blower. The dryer has a 30" fan which blows air from the butane heater to dry the cotton in the cleaners. The modern gins in the Mississippi valley are equipped with cotton dryers to condition damp or wet cotton. There is another 7½" dia. pulley with an 8" flat belt on 12' centers which drives a 48" pulley on the hydraulic press pump. A 23½" diameter pulley, carrying a 7" belt on 12' centers drives a 7½" pulley on a second 30" blower fan, blows the lint or ginned cotton to the power press.

A 25" pulley with an 8" belt on 12' centers to an 8" pulley drives a 30" exhaust fan which blows cotton boll hulls outside to the hull pile. One 19½" pulley carrying a 6" belt on 15' centers to a 30" pulley drives a 6-drum cleaner. One 7" pulley with small flat belt on 12' centers driving a 22" pulley on the distributor which distributes the cleaned and dried cotton to the gin stands for ginning.

The experience with two Cummins Diesels speaks for itself, according to Mr. Barton, who believes that this type of engine furnishes the most efficient and economical as well as reliable power for the cotton gin. With two seasons on the first engine and one season on the second, every expectation has been realized.

MASS.

By ART MICHEL



WHEN Captain John Smith explored and wrote his praises of the land at a certain spot along the Massachusetts coast, he began the recorded history of the Town of Ipswich. Incorporated now for 307 years, Ipswich treasures its past, and successive town governments have seen to it that nothing intrudes upon the Colonial beauty and serenity which make life so pleasant there. Yet for all its history, or perhaps because of it, Ipswich thrives in very much of a present lively existence. Industry flourishes there without causing any of the residential dislocations suffered by strictly industrial towns. Ipswich has always supported industry, drawing its own sustenance from it equally with agriculture and the sea. And while we are here interested chiefly in one of New England's finest municipal Diesel plants, a clear and comprehensive picture of the town it serves will enhance our appreciation of its achievements.

From the harbor where Ipswich captains once set sail to establish and command the roaring China and Malay trades, low fertile hills blanketed with sweet grass roll back to the town. This land now as for a century past, is pasture for blue-ribbon herds of blooded dairy stock, renowned through the agricultural East.



Upper left: New England atmosphere pervades this view of the Ipswich power plant. Above: general view of the engine room. Right: Aerial view of Ipswich with its churches dominating the center of the scene.

Air Photo by Hartley and Arnold, Boston Municipal Airport. Others by H. Kratovil, New York.

And from the vast salt water flats of the bay, diggers take in carefully controlled quantities each year the Ipswich Clam—as great a delicacy as Baltimore Terrapin.

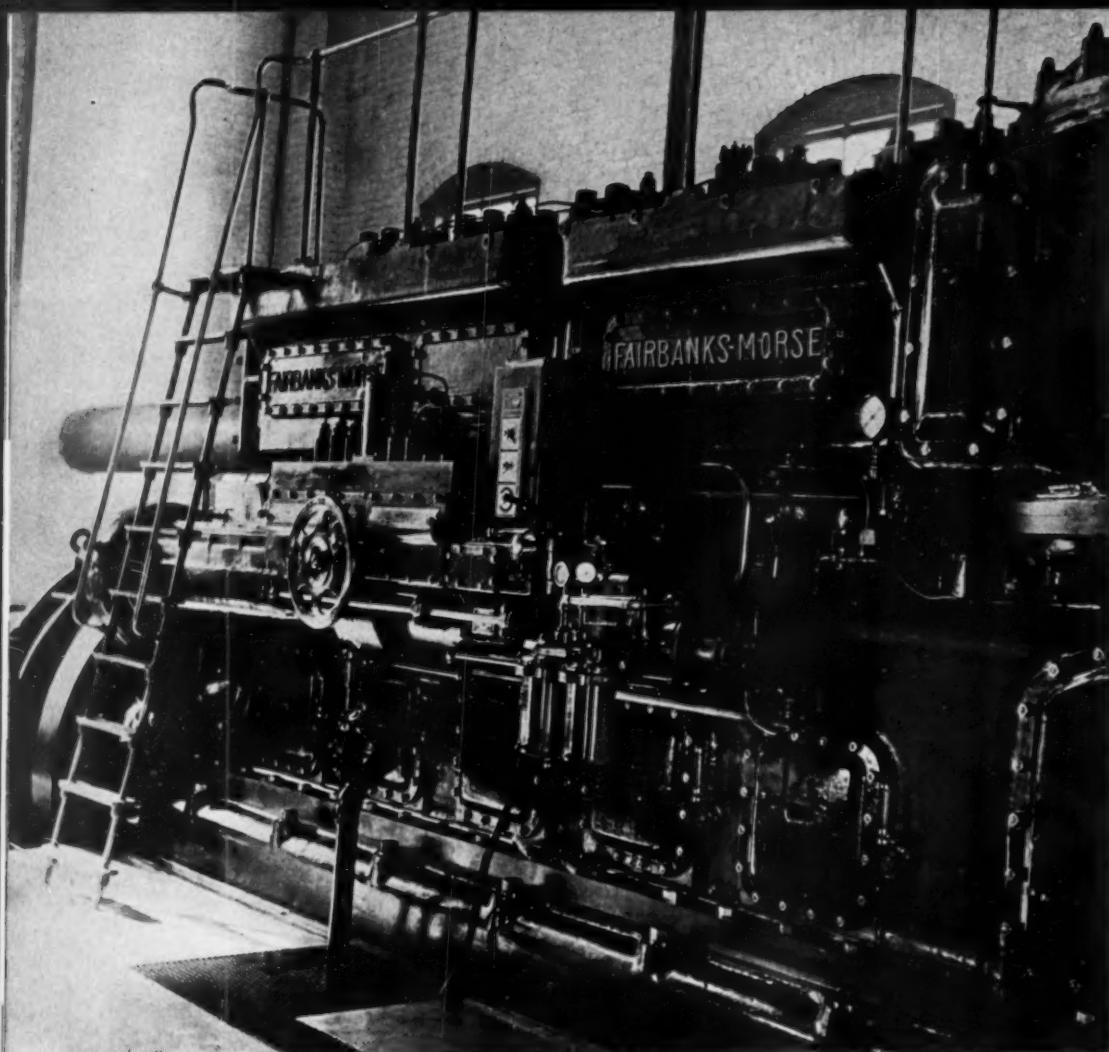
Closer to the town are hosiery mills, established at the very start of the Industrial Revolution in the early 1800's, and these, in turn, were inevitably an outgrowth of the days when Puritan women established an Ipswich textile industry with quantity production of fine hand-made lace. A large new plant for the manufacture of fluorescent lighting fixtures and tubes, and a new shipyard, (with four boats now on the ways and built with Clipper Ship technique) are the other principal industries of Ipswich. The main street, a representative





↑ Rear view of the Ipswich plant showing Maxim exhaust silencers, right, fuel storage tank and American intake air filter, left.





Operating side of the newest F-M Diesel installed at Ipswich in 1937, an 875 hp. unit. Note Migent filters and Woodward governor, center.

shopping center for the town's 6,340 people, retains the neighborly dignity characteristic of the Colonial atmosphere set by many priceless examples of pre-Revolutionary architecture.

That's Ipswich. And here is its Municipal Light Department—perhaps the largest common reason why Ipswich's older industries have had a prosperous rebirth; why new industries (including those mentioned) have been profitably attracted; why Ipswich people pay nearly the lowest electric rates in the state; why a throng of "summer people" are encouraged to establish part-time homes there, and why the town has been able to lower its tax demand by \$52,000 in the past five years. 1926 was the last year of steam at the Ipswich municipal power plant. The town had been paying ten cents per kwh. for street lights, and the consumer, twelve cents per kwh. for domestic current. Now after fourteen years of Diesel operation, that consumer pays four cents and the town, for streetlights, pays only the minimum required by state law—around two cents per kwh. In Ipswich the Diesel has set in motion its cycle of progressive change—lowered rates, higher consumption then

rates lowered again, and again. A chart of these fourteen years would show one heavy line of unfaltering plant growth, and another of increasing department income. An alert, civic-minded Light Department management reported \$35,028 net income in 1940—after a rate reduction in July of that year, totaling \$7,000.

The physical appearance of the power plant itself reflects the excellence of the department in general. Four Fairbanks-Morse Diesels, totaling 2,475 hp., are housed in a spacious structure flooded with light from big windows. These Diesels drive four Fairbanks-Morse alternators, (1,913 kva. combined) and exciters of the same make. I first visited the plant unexpectedly one Sunday and saw this equipment, spotlessly clean, reflected in the mirrorlike surface of the painted concrete floor, and instinctively felt that everything found in the entire municipal set-up—plant and management—would be in just such efficient order.

The exterior view of the "business end" of this plant displays the intake and exhaust arrangements for the Diesels. Each of the four ex-

hausts is fitted with a Maxim silencer. From the tank in the foreground, fuel flows by gravity to the regulators beneath the engines. In the basement are the lubricating oil tanks and rectifiers, with the starting compressors off by themselves in a room close to the engines. In the older part of the plant structure, (under the spires) are two 6" motor-driven pumps of the Water Department and control equipment.

The latest step in the steady expansion of this plant came in 1937, when the most recent of these Fairbanks-Morse engines was installed. This is an 875 hp. unit, the others rating at 350, 500 and 750 hp. All of the Ipswich engines are, of course, the low speed, two-cycle type and, although installed over a period of fourteen years, have a basic conformity of design which lends unification to the group and which provides a common structure for later changes with no alteration of fundamentals.

"Diesel Progress" finds its ultimate proof in profit and loss statements, and my intention here is to add another to the list of municipal Diesel case-histories; to show in this case what these Diesels, in combination with superb maintenance and sagacious management, have enabled Ipswich to do in the way of attracting and then keeping industries and residents interested in the advantages of a well run municipality. The benefits are directly apparent in industrial and household budgets, as taxes are kept down by the Light Department's direct contributions, (\$11,000 in 1940) towards the reduction of the town debt, and by the minimum rates charged for public services. The Annual Report of the town for 1940 shows a surplus of \$181,792, in the Electric Light Department—and a depreciation fund of \$43,540—with a current plant investment of \$326,559. These are the tangibles, while the benefits not shown on balance sheets continue to accumulate. A loyal citizenry, solidly behind the men who have engineered these developments, is possibly the greatest intangible asset of all, with the town's sense of self-sufficiency and security not far behind in importance. As Ipswich adds to its prestige among communities, the Diesel counts up another accomplishment in the public service.

Since the above story on Ipswich was written, the Ipswich management has voted to replace its 350 hp. engine with a new 1050 hp. Fairbanks-Morse Diesel. The electrical output at Ipswich has been increasing due both to expanding industry and increasing use by consumers, and this new engine, at the present rate of increase, should provide Ipswich with enough capacity until 1951.

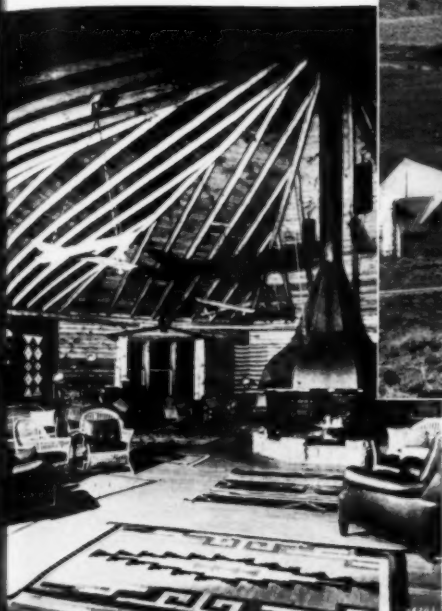
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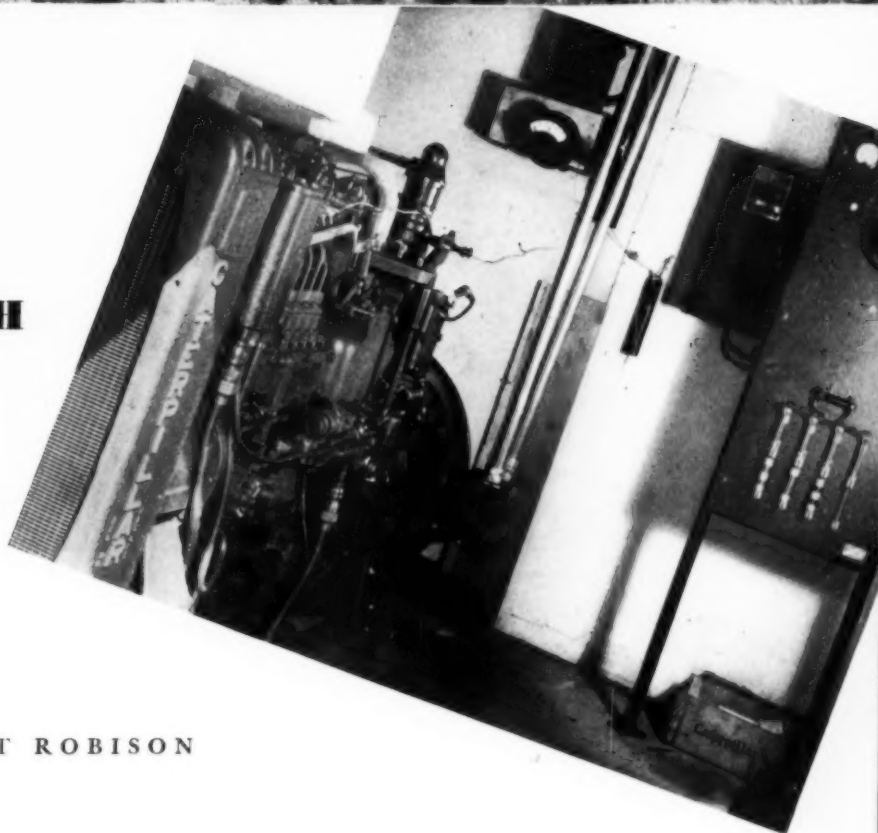


DIESELIZED A-BAR-A RANCH

THE people who hook their boot heels over the corral rail at A-BAR-A Ranch, Encampment, Wyoming, in the above view, are likely to speak with a Boston accent; or carry the weight of some big eastern business under their sombreros.

Most of them are on hand to find fun and relaxation. They take the clear air of the 7,000-foot altitude, the high-bred saddle horses that they ride, the good food and the comfortable accommodations as a matter of course. They have a great variety of things to do, when and if they want to be active. Life, for them, progresses as they want it to—in a very unbusinesslike and unplanned atmosphere.

Mr. Anderson has divided the ranch year into three seasons, opening June 1 with the summer season. This lasts until September 30, and features general ranch and cattle activity. (A-BAR-A supports more than 2,000 head of prize winning cattle on its 30,000 acres.) During the fall season, from October 1 to December 15, guests come in for the great cattle round-up, and for the excellent big game hunting. The winter season has A-1 snow conditions and a balmy climate to make ideal skiing. A-BAR-A has a ski school, with professionals in charge to aid beginners.



By DWIGHT ROBISON

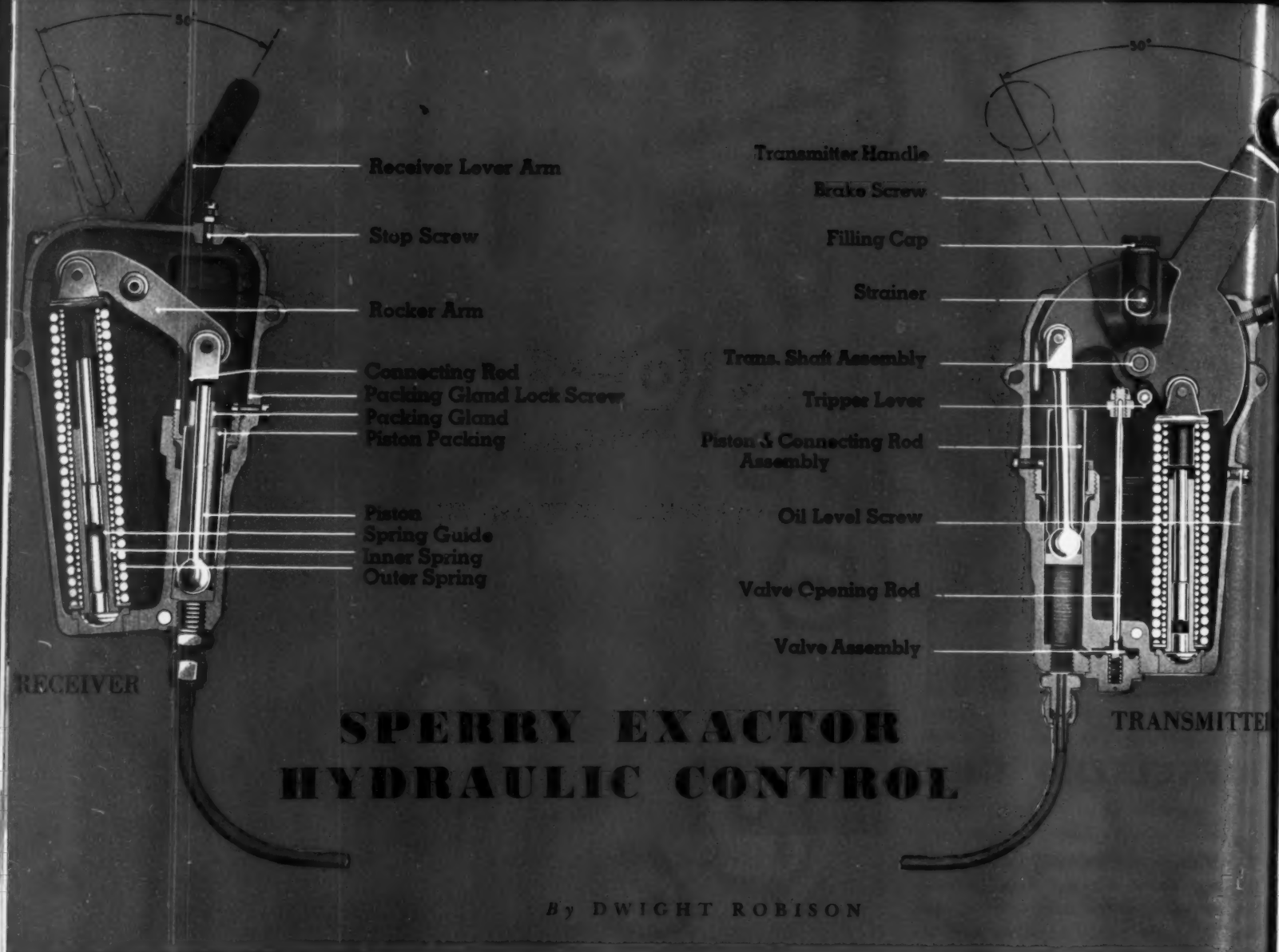
Though dude visitors like to rough it, they are also used to the comforts of urban life and, as a consequence, A-BAR-A has every modern convenience to offer. The guest reads by the best electric lamps.

The power plant is a four-cylinder Caterpillar Diesel engine, also shown above, direct-connected to a General Electric 20 kw., 3-phase, 60-cycle, 120-208 volt, 4-wire generator. An instrument panel with AC ammeter, AC voltmeter, 4-pole 100 amp. knife switch, current transformers, connections, etc., and a Ward Leonard voltage regulator complete the equipment. The engine is not far removed

from the residence buildings, but exhaust noise is kept down by a Burgess Snubber.

The plant is in operation about nineteen hours a day, and carries four 1 hp. motors and five smaller motors, in addition to laundry equipment. There are four hundred 40 and 60 watt bulbs in the line.

Under a highly varying load, the engine burns a little over ten cents worth of fuel, and requires 2.4c worth of lubricating oil hourly. Figures, including depreciation and maintenance, show current cost to be considerably less than 2c per kwh.



THE Sperry Exactor Hydraulic Control supplies a long felt need in the Diesel field for a positive action device suitable to transmit governor motion to fuel injection pumps, or manual fuel regulation and reversing action from remote points without lost motion and presenting a minimum of installation complications. Briefly, the "Exactor" control consists of two elements: The Transmitter fitted with a hand lever, and the Receiver which delivers through its lever the work applied to the Transmitter. Transmission is dead beat and free of lost motion or resilience. The only connection is the single tube which can be bent so as to pass any intervening obstructions. Furthermore, short lengths of flexible connecting pipe may be used if either the Transmitter or Receiver is subject to movement. The cylinders of Transmitter and Receiver are each fitted with a trunk type piston, fluid tightness being insured by a specially packed gland. The cylinders and connecting pipe are completely filled with a liquid of low freezing point and, since both cylinders

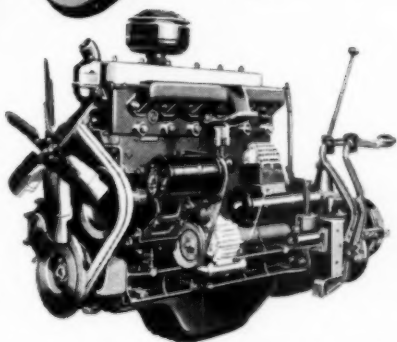
are of equal diameter, a downward movement of one piston must result in a similar upward movement of the other. Pistons are connected by rod and radial crank arm to their respective shafts, so that longitudinal movement of pistons is converted into rotary movement of shafts. Fluid in the system is kept under pressure at all times by means of opposing springs acting on the two pistons. Angularities designed into the mechanism counteract the varying forces of the expanding and contracting springs so as to maintain constant piston pressures at any point in the stroke. Any variation in volume is automatically compensated for, a deficiency being made up from the reservoir of an excess being driven out by the receiver piston which, on release of the pressure, is forced to the bottom of its stroke under the action of its spring. The initial backward movement of a few degrees of the transmitter allows the valve to close and any further movement will be exactly reproduced by an equal movement at the receiver. The Exactor Type C Controls

will deliver up to 100 in. lbs. torque, through an angle of 50 on the suction stroke, and safely two to three times this amount on the pressure stroke. This is equivalent to 85 in. lb. linear work. The Sperry Exactor Control offers advantages to railroads where the engines in rail cars and locomotives must be controlled from both ends. This system of hydraulic remote control is incorporated in a number of Diesel rail cars that are being built by Whitcomb Locomotive Company, H. K. Porter Locomotive Company and are installed in a number of locomotives used by Bethlehem Steel Company, U. S. Navy Yard, Philadelphia, Pa., and Missouri-Pacific Railroad. By means of the Sperry Exactor Control, marine engines, electric generators, refrigerator plants, engine room telegraphs, etc., may be controlled accurately from a central station on the ship. Successful applications of the Control on marine engines have been made by the U. S. Navy in motor torpedo boats, General Motors Research Laboratory, and Cooper-Bessemer Corporation.

AS TRUCK OWNERS GO FOR DIESEL POWER

TRUCK MAKERS Go for AUTO-LITE!

MODERN trucks operate on exacting, punishing schedules. Low cost miles from Diesel power is valuable only when it is combined with unfailing performance. Starting dependability with Diesel Power can be assured through the choice of Auto-Lite's new two-step starting motor. This ingenious starting motor provides the excess of power so essential in Diesel operation. Quick, sure starts are assured even in sub-zero weather. But the tremendous full power is exerted only with gears fully meshed. Meshing is done on a reduced voltage to give quieter, more efficient operation, to prolong the life of the equipment. Possibility of damage to housing, pinion and



ring gear is eliminated insuring trouble-free service, lower costs. Auto-Lite Starting and Generating Systems for Diesels are designed and built by the world's largest independent manufacturer of automotive electrical equipment. Auto-Lite Two-Step Diesel Starting Motors are available in both manual and automatic pinion shift types. Auto-Lite Shunt Generators can be

supplied for 12, 24 and 32 volt systems, 100 to 1000 watts capacity. The Auto-Lite Heavy Duty Voltage Regulator maintains voltage to plus or minus 2%. For prices and complete details, write to **THE ELECTRIC AUTO-LITE COMPANY • TOLEDO, OHIO**
ELECTRIC AUTO-LITE, LIMITED • SARNIA, ONTARIO

One of Howard Johnson's Diesel-equipped trucks—starting and generating equipment by Auto-Lite.



23 DIVISIONS—MORE THAN 400 AUTOMOTIVE PARTS AND APPLIANCES

SUPERVISING & OPERATING ENGINEERS' SECTION

PREVENTIVE MAINTENANCE

By R. L. GREGORY

AT the recent annual meeting of the Midwest Power Conference, considerable stress was laid upon the point of "Preventive Maintenance" as applied in Power Plants and Industry. This practice has long been advocated by the engineering profession as a means of lowering maintenance costs. Many plant engineers have been lax in adopting the practice, however, either because they have relied upon periodical inspection of their equipment, or because they have felt that the practice entailed an extra amount of work which their operating schedule would not permit. Periodical inspection of equipment is good insurance in any plant and should be carried on. It is not, however, the full answer to the problem of procuring the most efficient method of maintenance. Due to the many integral parts of the Diesel engine and the varying conditions under which it operates, the Diesel plant affords an excellent field for "Preventive Maintenance."

Every Diesel plant engineer has his own ideas and methods of maintenance. But there are certain necessary requisites, most of which are found in our modern plants, that are essential to a program of "Preventive Maintenance". The first requisite is a good Daily Log Sheet, wherein the operating conditions of temperatures, pressures, fuel consumption, and output are periodically recorded. By studying this sheet, the plant engineer can ascertain just what efficiency he is obtaining from his various units. And this sheet should be studied. A Diesel engineer would never think of removing the various recording charts from his instruments, and forgetting them. They are useless unless studied, and so is the Daily Log Sheet. Every Diesel plant should include among its equipment a good indicator. This is a valuable asset in checking up the performance of his Diesels. By weekly indications of the various engines he is often able to detect defects and correct them in advance of more serious trouble. In other words, carry out a little maintenance which will prevent more serious difficulties. Should he find, upon taking an indicator card, that some certain cylinder showed a drop in compression, the head of that cylinder should be removed at the first opportunity, the piston pulled, and the rings and piston as well as the liner inspected.

Some record, such as we use in our plant and which is shown in the accompanying cut, is a valuable asset in recording the condition of liners, pistons, and rings. Liner wear should be checked occasionally, whether needed or not, as it may become excessive due to a preventable cause. In checking liner wear, a good set of inside micrometers and a jig, made so that the readings can be obtained each time at identical points along the line of ring travel, are essential. These readings should be taken parallel to the shaft and at angles of 45°, 90° and 135° to the shaft. If also taken at the four vertical points as indicated, there should be sufficient readings to give an accurate con-

dition of liner wear.

There always arises the question of how much wear a liner should show over a period of time. Naturally, liner wear rate will be greater on a new engine the first few months of operation, but the average rate of wear on units of 16" bore or larger may approximate 0.003" per 1000 hours of operation. That is based on the present day liners as used by many of the manufacturers. In smaller units of smaller bore, the average wear rate will approximate 0.001" per 1000 hours of operation, and in some instances will be only 0.001" for several thousand hours of operation. Of course, there are several conditions which govern liner wear. It will depend upon the material from which the liner, piston, and rings are manufactured: Upon the grade of fuel oil and lubricant used, also upon the number of times the unit is started during the 1000 hours of operation. It is generally agreed that liner wear is somewhat proportional to the number of times the unit is started.

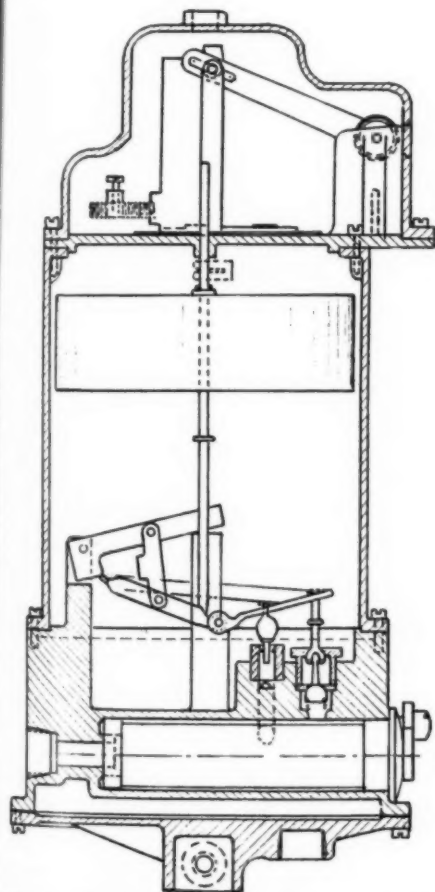
Occasionally upon removal of a piston, the liner is found to be scuffed or scored. A scuffed liner can easily be repaired by honing, as it is merely a light condition of scoring. A scored liner, if not too bad, can be repaired by first using a good grade of fine emery wheel and then finished with a fine oil stone. When such conditions are found, they should have immediate attention because even light scoring gives potential possibilities of blow-by and leakage if not given preventive measures. Bad scoring of a liner generally demands liner replacement which is costly and runs the maintenance cost up.

By going out of his way a little, however, a plant engineer can follow the practice of "Preventive Maintenance" to great advantage not only in reducing maintenance costs but also in keeping his equipment efficient and in continuous operation.

Date	BOARD OF PUBLIC WORKS HILLSDALE, MICHIGAN		Engine No.
Diesel Engine Liner and Piston Ring Wear			
Customer:	Order No.		
Engine Type:	Cylinder No.	Engine No.	
Normal Rating:	B. H. P.	K. W. at	R. P. M.
Original Liner Bore:			
Date Inspection:	Date Last Inspection:		
Hours Operated Since Last Inspection:	Average Load		%
Lubricating Oil Data:	Cylinder Oil Used	Gals. per 24 Hours	
	Corresponding to	B. H. P. per Gallon	
Brand of Oil:			
Name of Oil Company:			
Number of Lub. Oil Holes	Top or Bottom Lubrication		
Cylinder Liner Wear Since Last Inspection			
T.P. - Top Position of Piston Ring Travel	Location	Par.	45° 90° 135° Average
Par. - Parallel to Crank Shaft	A. 4" Below Top Pos.		
	B. 6" Below Top Pos.		
	C. 2" Above Port		
	D. 2" Below Port		
Remarks:			
Total Cylinder Liner Wear To Date			
Location	Present Average	Previous Average	Total Wear To Date
A. 4" Below Top Pos.			
B. 6" Below Top Pos.			
C. 2" Above Port			
D. 2" Below Port			
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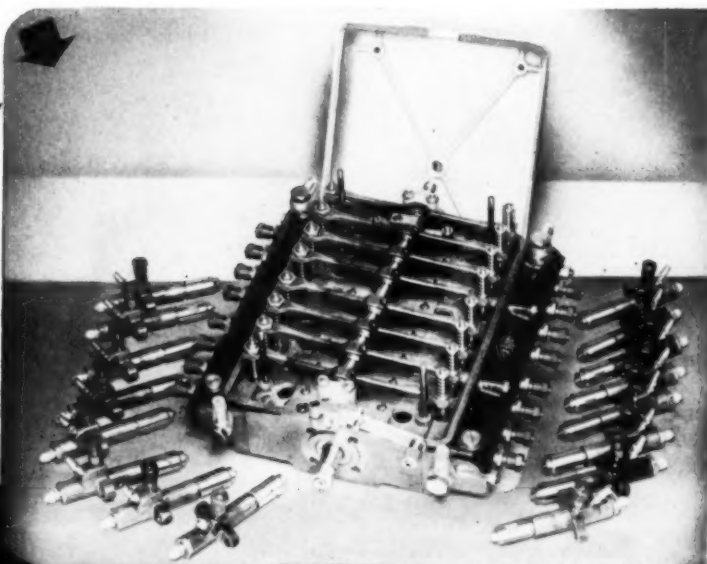
VESTA METER FOR FUEL OIL MEASUREMENT

DIESEL owners and operators will be interested in an entirely different type of fuel oil meter that maintains its accuracy regardless of how small the rate of fuel flow may be. The secret is a positive displacement design that gives continuous and accurate measurement in tenths of a gallon of all fuel that passes. Since the fundamental operating principle of the Vesta Fuel Oil Meter is based on oil volume only rather than speed of oil flow, this simple and compact unit is particularly adapted to Diesel installations and provides a check on fuel consumption heretofore unknown. In fact, the unequalled accuracy and convenience of this measuring unit combine to give Diesel owners new operating data for maintaining acceptance test performance throughout the entire life of the engines so protected.



Although accurate to within one quarter of one per cent the Vesta Fuel Oil Meter is strongly built with ample protection for its precision mechanism. It is quickly and easily installed and requires no further attention. Operation is entirely automatic, and fuel consumed is registered continuously by a Veeder-Root counter which runs to 9999 9/10 gallons and then repeats. The meter is 12" high, 5" in diameter and weighs only nine pounds.

Adeco delivers ALL-OUT PERFORMANCE *on Developments like this*



NEW 16-CYLINDER PORT
CONTROL PUMP...ORDERED
FEBRUARY 15, 1941...DELIV-
ERED MAY 9, 1941...COST
TO CUSTOMER \$14,000

Here's the kind of proof you want of the value of ADECO craftsmanship in helping you meet today's defense demands.

Pictured above is a special development of a 16-cylinder port control pump designed and detailed by ADECO engineers—produced without production tools

by ADECO craftsmen—calibrated and tested in ADECO laboratories—and delivered to the customer in remarkably fast time.

This ADECO "All-Out" experimental work is available to customers only in connection with their defense production.

**AIRCRAFT AND DIESEL
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4409 NORTH RAVENSWOOD AVENUE, CHICAGO, ILLINOIS

Master Craftsmen of Fuel Injection Equipment and Precision Parts for gasoline-
powered Aircraft and Diesel Engines on Land, Water and in the Air

MORE HOURS BEFORE ENGINE OVERHAUL ... RISLONE ELIMINATES GUMS and STUCK PISTONS



Shaler Rislone Co.
Waupun, Wisconsin.

Gentlemen:

In regard to Shaler Rislone of which we use considerable in large Diesel engines. We have for years experimented with different oils and agencies for putting gums from the piston rings and cylinder walls of Diesel engines. Diesel engines have considerable more trouble with the common carbons and gums than the regular four cycle gas engines. We are pleased to state that we are putting our indorsement to Shaler Rislone for the use of it in large engines. No one knows better than we do what it does to the life and power of a laboring engine, (it is like giving a cool and refreshing drink to a tired and thirsty man).

We service and rebuild Diesel engines for large power users throughout the middle-west, and we have had the pleasure of seeing large engines after they have used Rislone taken down for regular inspection. These engines did not have the usual gummed up rings and cylinder walls as they had experienced before, but instead the rings were free, piston and cylinder clean. Therefore we repeat the consequent saving to the user. That when ever we can give Rislone a boost with the Diesel engine user we will certainly do so, and you may have operators write us direct.

Yours very truly,

Wm. E. Exline
Exline Diesel Engine Works.

WE/YG

RISLONE is available in
factory-sealed containers,
—one qt., 1½ etc.; 5,
15, 30 and 50 gal. drums.

The Shaler Company,
Waupun, Wisconsin.

Gentlemen:

We have recently finished a nine months (2450 hours) run on our Buda Diesel Model D6-30 using Shaler Rislone. This is the best performance record we have obtained since this engine has been in service by three months, before having to take the engine down to remove carbon and free stuck rings.

At the first of the year the engine was inspected and we found the rings to be free and a minimum of carbon deposit on the piston and combustion chamber. Prior to this in a much shorter time of operation we found a great many of the rings stuck and heavy carbon deposits on the piston and in the combustion chamber.

We are reporting this to you for your information.

Very truly yours,

BIG MANUFACTURING CO.
Ben E. Eppertine

EP:JI

RISLONE added to the regular lubricating oil reduces gum formations in the ring grooves and valve stems,—and thus insures longer periods of operation before overhauling and reduces maintenance costs. Rings, pistons and cylinders are kept clean. RISLONE'S high capillary attraction assures adequate lubrication of all moving parts.

Use RISLONE with your regular lubricating oil or special Diesel oils to reduce gum and carbon formations to solve your ring or valve troubles—to give you more hours of good engine performance... Our 64-page book "Engine Performance" will be mailed on request. THE SHALER COMPANY, Waupun, Wisconsin.

DIESEL TRUCKS CUT COST

Continued from page 41

Diesel operation. The truck was bought in April, 1939, and now has accumulated about 160,000 miles. It operates between Milwaukee, Minneapolis, and La Crosse carrying heavy loads of general freight including batteries. It has operated with small service expense and a large saving in fuel cost. On a run between Milwaukee and Mauston, a distance of 135 miles, the time required was four hours or 34 mph.

Based in Minneapolis, the Land O' Lakes Company is the largest sweet cream butter seller in the world and their truck fleet includes five Dodge-Diesel trucks. The trucks operate throughout Minnesota and North Dakota carrying butter and other dairy products. The trucks were purchased on the following dates and now have the mileages indicated: A, May '39, 85,000; B, Sept. '39, 51,000; C, Sept. '39, 59,000; D, July '40, 31,000; E, July '40, 24,000.

These trucks go out on trips ranging from eight to seventeen hours and from 123 to 1,000 miles in length. They are in charge of two drivers at all times. They operate under rather severe winter conditions. For example, the coldest day in Minneapolis last winter was 37 degrees below zero and there were two-week periods when the temperature ranged between 20 and 30 degrees below.

At 52,000 miles the engine of truck "A" was torn down and rings replaced and valves ground. The oil rings were found to be partly plugged with carbon. The bores were in excellent condition and required no attention. At 1,500-mile intervals the lube oil is drained and not reclaimed and the filter is changed. Two quarts of oil are used in 1,500 miles on each of these trucks. The Land O' Lakes drivers prefer to drive the Diesel trucks because of appreciable savings in time for any particular trip over comparable gasoline powered trucks.

Comparative operating cost records of a gas truck and Diesel truck, for sixteen consecutive months, show that the average cost per mile for the Diesel is \$.1523 compared with \$.18545 for the gasoline powered truck. The figures cited are not from special cases but represent average performance.

An outstanding Dodge-Diesel operation is that of the Chippewa Springs Corporation of Minneapolis, which hauls bottled spring water from Chippewa Falls, Wisconsin, to Minneapolis and

RISLONE

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makes about two round trips per day or 11 per week. This figures up to about 120,000 miles per year, as one round trip represents 210 miles and requires eight hours time. The payload hauled to Minneapolis is 28,000 pounds and the gross is 43,000 pounds. On the return trip, empty bottles in cases and on skids constitute the load.

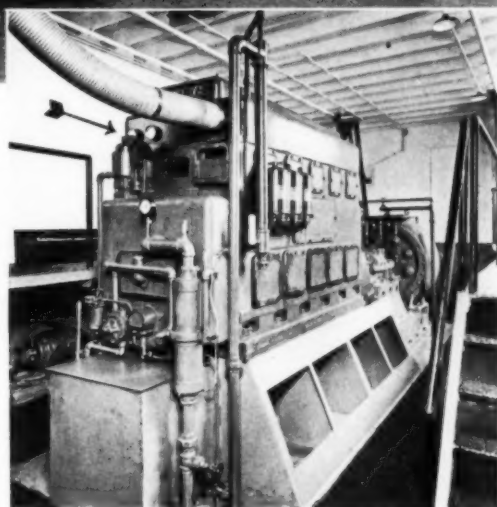
According to conservative figures the Chippewa Spring Corporation will save about \$4,000.00 per year by using a Diesel truck as compared to moving this freight by rail. An interesting part of this account's operation is an arrangement with the selling Dodge dealer whereby the truck is completely serviced and maintained in top-notch running order at a predetermined cost per mile. Since many Dodge-Diesel trucks now have accumulated between 100,000 and 200,000 miles of use, it was possible to predict service expense for the life of the vehicle. Two drivers are employed and paid on a mileage basis. Thus, the management of this operation has been reduced to a minimum of effort.

Still another interesting Dodge-Diesel operation is that of Zaiser's Dairy of Montevideo, Minnesota. The weight of this tractor unit is 7,500 pounds, the trailer is 13,000 pounds and the payload 12,000 pounds, which is a total gross of 32,500 pounds. This gross does not vary over 1,500 pounds, as fresh cream is picked up at points enroute which compensates for the ice cream unloaded. The total round trip this truck operates is 335 miles. Four round trips weekly are made during the summer months when the ice cream business is at its peak and this tapers down to two round trips per week in midwinter. The road traveled consists of 120 miles of tarvia, 110 miles of gravel and 105 of paving. The route operated is through a generally level country but there are several rolling and hilly places enroute.

The longest grade is about one mile in length and the grades vary from $1\frac{1}{2}$ to 3 per cent. About fifty miles of the tarvia road on this route is very soft and during warm weather is hard going. The average mileage obtained so far is 8 miles per gallon, which includes approximately two hours idling time on each trip, at a cost of .0143 per mile. The lubricating oil consumed averages about five quarts per 1,000 miles, not including the oil changes. The best previous average on a gasoline tractor over the same route was a trifle over five miles per gallon. This unit is equipped with a two-speed rear axle with a 5.83-8.11 gear ratio using 9.00 x 20" dual



This Shallow Draft Diesel Dredge Protected by "Alnor"



The new Diesel-powered dredge "W. J. Gex" is owned and operated by Hancock County, Mississippi. Its purpose is to make and maintain a sloping beach to protect a seawall along a 12 mile stretch of scenic highway which parallels the river.

Because of the shallow draft necessary, this dredge required special design, yet with ample power assured.

The main power unit is a 240 h.p. 5-cylinder Buckeye 10 x 12 Diesel which is equipped with an "Alnor" Exhaust Pyrometer to give instant readings of the exhaust temperature of any cylinder.

"Alnor" Pyrometers are applicable on every type of Diesel small or large.

Reasonable in price, "Alnor" Pyrometers are a profitable investment for anyone operating Diesel engines.

Buy or specify "Alnor."

 **Illinois Testing Laboratories Inc.**

423 NORTH LaSALLE STREET, CHICAGO, ILLINOIS

MANUFACTURERS OF "ALNOR" AND PRICE INSTRUMENTS

PRODUCTS OF 40 YEARS' EXPERIENCE

rear tires. The operators find that it handles the load very satisfactorily with a saving of about three hours' time over the previous gasoline tractor.

In the hands of organized operators the Diesel truck is a means of effecting large economies in continuous or long haul operation. As Diesel engine progress goes forward and production increases, we can expect important gains for Diesel engine applications.

BUDA OPENS WASHINGTON OFFICE

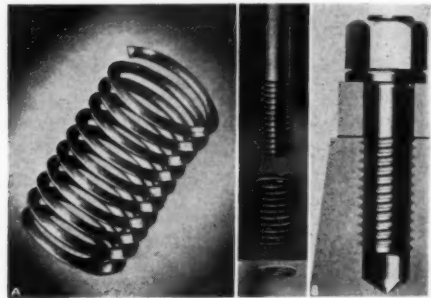
THE Buda Company has announced the opening of an office and display room at 1169 Church Street, Washington, D. C.

The office is under the direction of Col. H. H. Frost, Vice President. G. C. Humphreys is manager of engineering, and E. C. Asher is office manager.

NEW TYPE SCREW THREAD SYSTEM

A SCREW thread system, known as the AERO-THREAD now being widely used in the aircraft industry where screw fastenings of unusual strength are necessary in the lighter metals such as aluminum or magnesium alloys, will prove interesting to many readers of DIESEL PROGRESS.

This system involves the use of a precision shaped spring wire insert usually made of phosphor bronze or stainless steel which is threaded into a tapped hole having threads different in size but similar in form to the American National coarse threads series. The wire is so formed that its "V" shaped edge contacts the tapped hole threads, wedging securely therein. The opposite side of the wire is semi-circular in cross section and forms the thread which engages a special formed screw. The



insert has the ability to distribute or equalize stresses over the full thread engagement of the tapped hole and also offers full protection to the threads, since the screw or stud makes contact only with the insert and not the lighter metal itself. The Aero-Thread form is a radius with no sharp corners or notches. Tests show an approximate increase of 100% or more in fatigue strength when compared with American National coarse threads of the same nominal diameter.

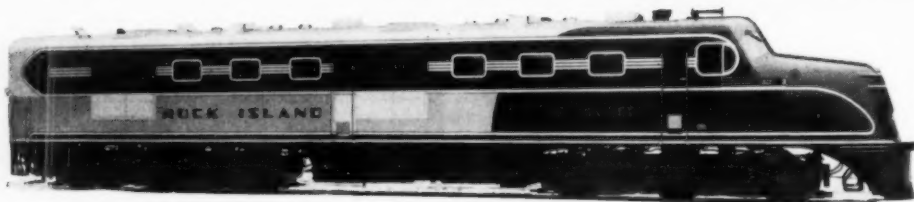
Write for complete information to Aircraft Screw Products Co., 4723 35th St., Long Island City, N. Y.

DEATH TAKES COOPER-BESSEMER PRESIDENT CHARLES B. JAHNKE

CHARLES Bernhardt Jahnke, president and general manager of The Cooper-Bessemer Corporation, died at Mercy Hospital in Mount Vernon, Ohio, on Tuesday afternoon, May 6, 1941. A heart attack, suffered while he worked in the garden of his home on the previous Saturday afternoon, proved fatal to Mr. Jahnke. After hopes for his recovery had brightened during Monday.



Speaking of Specialized Cooling Jobs



Specially designed radiators for maximum cooling efficiency of both water and oil mounted on both sides of car. Propeller type fans in the roof draw air through the cores and exhaust it to the outside.

On the cross country run between Chicago and Denver another modern streamliner goes into service. The locomotive of this great flyer . . . built by the American Locomotive Company for the Rock Island Railroad . . . is powered by two giant 1200 H.P. Diesels, each of which is cooled by a separate radiator system.

The Young Radiator Company is indeed proud to have furnished the radiators for this installation. It is another display of confidence in their ability to tackle a tough specialized cooling job and produce unfailing results. Cooling of all types of internal combustion engines is an old and familiar story to the Young Engineering staff. Why not consult them about your particular heat transfer problem?

YOUNG RADIATOR COMPANY, Dept. 231-F, RACINE, WIS.

A FEW OF MANY WELL-KNOWN USERS OF YOUNG PRODUCTS

American Locomotive Company
Baldwin Locomotive Works
The Buda Company
Chicago Pneumatic Tool Company
Waukesha Motor Company
Electro-Motive Corporation
Marmon-Herrington Company, Inc.
Le Roi Company
Sullivan Machinery Company
Boeing Aircraft Company
Douglas Aircraft Company, Inc.
Brewster Aeronautical Corporation



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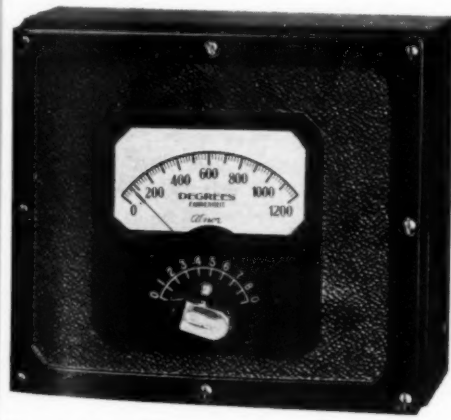
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Born at Cincinnati, Ohio, in 1889, Mr. Jahnke graduated from the University of Cincinnati and was for twenty-one years associated with Fairbanks, Morse & Company, having achieved the positions of chief engineer, works manager, and finally director of engineering. In 1931, he joined the International Harvester Company. Four years later he became affiliated with The Cooper-Bessemer Corporation as its chief engineer. In 1937, he became a vice-president and general manager of the corporation and, on December 27, 1940, was elected to the office of president and general manager.

Mr. Jahnke was a member of the American Society of Mechanical Engineers and Society of Automotive Engineers. He was a Thirty-second Degree Mason and an elder of the First Presbyterian Church of Mount Vernon, where funeral services were held on Thursday afternoon, May 8, 1941. Burial took place in Mound View Cemetery at Mount Vernon. Mr. Jahnke is survived by his wife, two sons, and two daughters.

A NEW ITEM IN THE EXTENSIVE "ALNOR" LINE
A NEW type Alnor Pyrometer, designed for use on marine auxiliary Diesels on all types of craft including Navy vessels, is offered in both front-of-board or flush mounted types. The aluminum case is extremely rugged and is splash or drip proof.



The case design is such that the modern flexible detachable thermo-couple can be directly extended and connected to the instrument case, thus eliminating the need for conduit and extensive wiring. The instrument is intended primarily for direct engine mounting. It can be furnished in switch capacities up to nine points, thus accommodating as many as eight cylinders and combined exhaust temperature. Full particulars regarding this new "Alnor" pyrometer may be had by writing direct to Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago, Illinois.

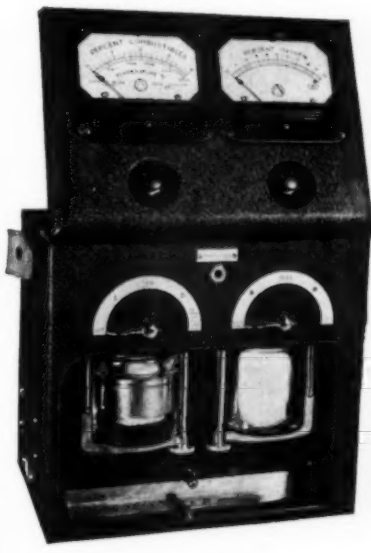
SOME RECENT DEVELOPMENTS IN FAIRBANKS-MORSE DIESEL ENGINES

IN order to round out the four-cycle Model 36 line of F-M engines, an 8-cylinder 4 1/4 x 6 engine has been developed. This is an inline engine rated at 80 bhp at 1200 rpm. and follows the general design of the other 4 1/4 x 6 sizes which have been made for several years from one to six cylinders.

This engine is available for either stationary, portable or marine service and may be furnished for either electric or air start. In line with current practice, it is arranged for indirect cooling and may be had with a built-in heat exchanger together with the necessary soft and raw water circulating pumps.

The air starting arrangement used on the Model 36-4 1/4 engines is also a recent development and is designed to replace the electric

Users of **CITIES SERVICE LUBRICANTS** get an **EXTRA ADVANTAGE!**



Heat-Prover Service is now available to users of Cities Service Industrial Fuels and Lubricants. This is an economy measuring service which you can secure in addition to the quality and economy advantages offered by Cities Service's SERVICE PROVED Fuel and Diesel Oils.

The Heat-Prover is an ingenious device—a by-product of our research in metallurgy. It registers continuously and instantaneously changes

in the amount of oxygen and combustibles in furnace gases. It is an excellent guide in adjusting 4-cycle Diesels and for combustion control in heat generating plants. In the heat treatment of metals, it is invaluable. It assures uniformity and reduces scrap losses.

Let us tell you how you can secure the use of one of these machines. Mail the coupon today.



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starting motor when air starting is required. It consists of a small air motor of Fairbanks-Morse design, having sufficient torque to start the engine with air pressures from 100 to 250 pounds per square inch. This arrangement is especially acceptable for auxiliary sets or for stand-by service in plants in which the main engines are already arranged for air starting.

Pressure lubrication has been applied to the well known line of Model 35 F-M engines in all sizes. The dry crankcase is still retained and two lubricating oil pumps, both of which

are built-in and driven from the camshaft, are employed. The used oil pump draws the oil from the crankcase drain header, forces it through a lubricating oil filter to a clean oil storage tank. The clean oil pump has its suction in the clean oil storage tank and discharges into the pressure header which supplies oil under moderate pressure to the main and crankpin bearings. A separate line also provides oil under pressure for the camshaft bearings, gears, etc. The pressure system also automatically keeps the force feed lubricator filled at all times and this lubricator in turn supplies

oil under pressure to the pistons, cylinder and piston pins.

Along with the pressure lubrication effective crankcase baffles have been developed to eliminate the oil from the scavenging air with the result that even with the pressure lubrication the lubricating oil consumption has been improved.

To further round out the line of marine propulsion engines, Fairbanks-Morse has recently developed an 8-cylinder 10 x 12½ Model 35 engine with pressure lubrication along the line of the other heavy duty two-cycle engines in this line. This engine is rated at 320 bhp. at 400 rpm. This engine is direct reversing and because of its compact design and logical speed horsepower ratio is already receiving an enthusiastic welcome.

Sensing the demand for continually increased horsepower of Diesel engines, Fairbanks-Morse is now actively selling 10-cylinder 16 x 24 engines of the pump scavenging type. In order to conserve over-all length, the scavenging pump for this latest engine is separately driven. For stationary generating service, the scavenging pump motor is driven from the main engine generator with arrangements so that the scavenging air motor is brought up to speed with the main engine thereby eliminating the necessity of a separate drive.

For the marine service, the scavenging air compressor is driven from the main auxiliary generating set, thereby allowing full shaft horsepower to be available for propulsion. The 10-cylinder marine engine is rated at 2000 bhp. at 300 rpm.

DIESELS FOR IRRIGATION

Venn-Severin Diesel Distributors Inc., Los Angeles, report the following installations for irrigation projects: One 300 hp., 4 cylinder 14½" x 16½", 2 cycle Diesel, belt-connected to a 5,000 gpm. Wintroath deep-well turbine pump at Elroy, Arizona for Mike Jones' long staple cotton venture.

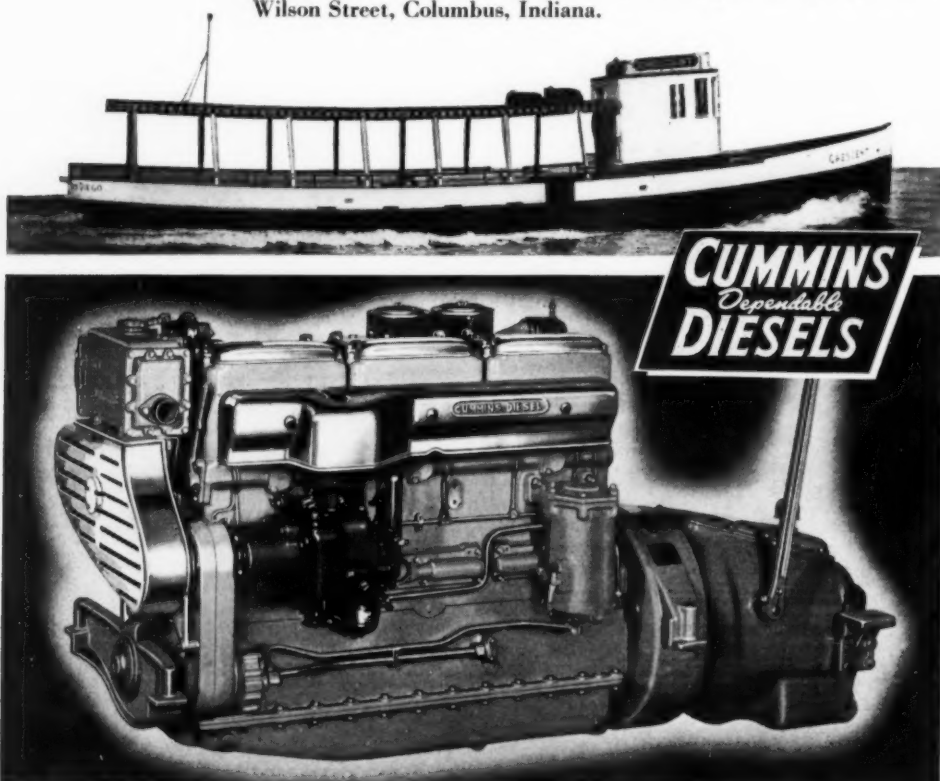
One 140 hp., 2 cylinder same dimensions, and a Layne-Bowler pump delivering 150 miner's inches on a 250 ft. head on alfalfa ranch, Palmdale, for Captain C. B. Colby, president of the Caminol Oil Co.

Two 140 hp., 2 cylinder same dimensions, and Johnston pumps, for potato irrigation in the Greenfield and Cuyama Valley districts, to Arnold and Adolf Kirschenmann, Bakersfield.

ALL-PURPOSE POWER FOR AN ALL-PURPOSE FLEET

The CRESCENT, 65-ft. harbor utility boat, was the fourteenth Cummins Diesel-powered unit added to the Star and Crescent fleet. Its Model HMR-600 Cummins Diesel (illustrated) delivers 125 hp. at 1650 rpm.

The Star & Crescent Boat Company, San Diego, operates 16 Cummins Dependable Diesels which power 14 boats of such widely varying types as sport fishing boats, ferries, tugs and water taxis. In this widely diversified service, the Cummins Dependable Diesel has consistently demonstrated its operating economy, its full-time dependability, its supreme flexibility. In addition, Star & Crescent—by standardizing on Cummins Diesel power—has effected important savings in maintenance costs . . . drastic reductions in idle time at the dock, because the Cummins Diesel's simple design and compact construction assure interchangeability of both engines and parts. For your boat, choose the proved, all-purpose power . . . specify Cummins Diesel power. Cummins Engine Company, 2316 Wilson Street, Columbus, Indiana.



STAR COMPANIES TAKE OVER NEW PLANT

THE illustration below shows the front of the new factory building recently acquired by the Star Electric Motor Company, the Star



According to Emil E. Hollander and Carl M. Peterson, President and Treasurer-Secretary respectively of the Star Companies, certain departments will start moving immediately after May 1st. It is believed that the complete moving job will be finished by January 1, 1942.

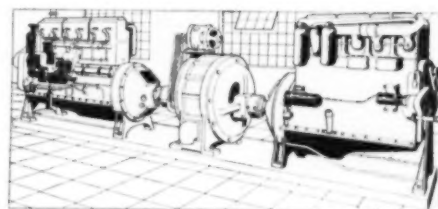
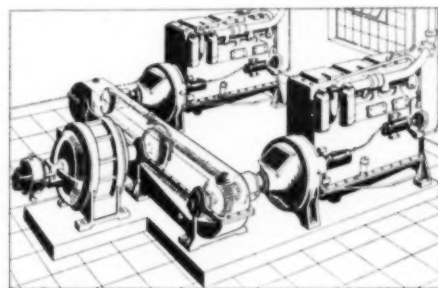
The Star Electric Motor Company was started thirty years ago by its present principal officers, Emil E. Hollander and Carl M. Peterson. It manufactures electric motors, generators, geared-head motors, magnetic brakes and similar power apparatus.

The Star Equipment Corporation was organized in 1933 as an outgrowth of the Motor Company. It manufactures chlorinated solvent dry cleaning equipment for the cleaning and laundry industries. The Star Machine and Engineering Company, started in 1935, manufactures precision drill grinding equipment.

MORSE CHAIN ISSUES ENGINEERING BULLETIN ON DUAL ENGINE DRIVES

IT has been demonstrated that plants of nearly any capacity are practical by use of multiple, standardized high speed Diesel or gas engines operating in parallel and auto-

matically controlled. Such arrangement of power sources minimizes operating costs because of its high operating load factor and its inherent low first cost. Multiple engine units standing ready for peak loads and emergencies offer exceptional dependability and availability.

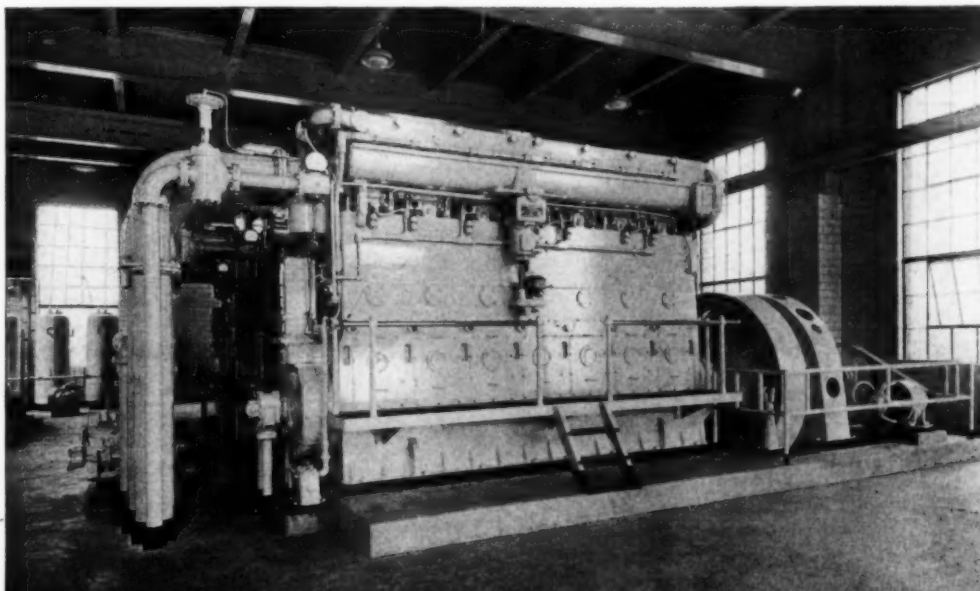


Morse Chain Company has recognized this trend in power plant design and has conducted exhaustive research in the adaptation of its

Saving \$25000 PER YEAR

THREE Rathbun-Jones Gas Engines—each rated 750 hp. at 300 rpm., direct connected to 500 kw. generators—supply light and power for over 175 electric motors in the Columbus, Ohio, Sewage Treatment Plant. After two years of service, comparison of the operating costs with that of purchasing the amount of power generated shows a saving of \$25,000 a year. A typical instance where engines especially adapted to the fuel are doing a remarkable job.

Let us estimate on your power requirements.



THE RATHBUN-JONES ENGINEERING CO.
TOLEDO • OHIO

widely known Silent Chain and Free Wheeling clutch couplings to harness dual engine units to a single driven unit.

The bulletin, just issued, presents the results of long study of this problem in clear, concise, operating and designing engineer's language, with sufficient tabulated material to permit selection of the proper drive units for a wide variety of power, speed and dimensional conditions. Every Diesel plant designer and operating engineer will be benefited by this constructive work. Write for a copy of Bulletin K-16 to Morse Chain Company, 7601 Central Ave., Detroit, Michigan.

NAVY TAKES OVER ADDITIONAL MARITIME COMMISSION C-2 VESSELS

ANNOUNCEMENT has been made of the purchase of three C-2 Diesel cargo vessels from the U. S. Maritime Commission for use by the Navy in auxiliary service. These three vessels are at present under construction at the Tampa Shipbuilding Company yard and are similar to the *Sea Witch*, now in the service of the U. S. lines, on the American Pioneer line to the Far East and Australia. These three new ships will be known as the *Meteor*, *Comet* and *Raven*.

THE STAYNEW FILTER CATALOG

STAYNEW Filter Corporation announces the publication of a new 44-page catalog, illustrating and completely describing the latest Staynew and Protectomotor Filters for compressed air, gases, liquids, engine and compressor intake, and for building ventilation. The new catalog is replete with photographic illustrations, sectional drawings, diagrams, specification charts, and detailed engineering data. It is the largest and most complete catalog ever published by the Staynew Filter Corporation, and contains a wealth of valuable information. The new catalog is mailed, without charge, to representative firms requesting it on their business letter heads. Address inquiries to Staynew Filter Corp., 5 Leighton Ave., Rochester, N. Y.

GULFPORT TO BUILD FOUR MORE G-M DIESEL TUGS

GENERAL Motors Sales Corporation of New York has ordered four all-welded steel tugs from the Gulfport Boiler & Welding Works, Port Arthur, Texas. These tugs will be 96 footers and will be powered with a 1200 hp. Diesel each.

ATLAS CONVERTS TWO MORE LONG ISLAND SOUND STEAMERS

A THIRD steamer of the Sound Steamship Lines, Pier 31-East River, New York, N. Y., will be converted to Diesel propulsion. The "Calvert" was converted in 1939, the conversion of the "Carisco" will be completed by June 1, and that of the "Pemaquid" next spring. All three ships will thus be powered with Atlas-Imperial Diesels, the two former with a 600 hp. six cylinder 15" x 19" unit each while the "Pemaquid" will have a 400 hp. six cylinder 13" x 16" unit. The "Pemaquid" registers 409 gross tons, being 132.5 feet in registered length with a beam of 28 feet and a depth of 9.8 feet. Formerly named the "Long Island", she is a steel vessel built at Philadelphia in 1893 for the Long Island Railroad but acquired by the Sound Steamship Lines in 1931. She is licensed to carry 580 persons on Long Island Sound.

BOLSTER TO NATIONAL SUPPLY'S NEW BOSTON OFFICE

THE National Supply Company, Superior Engine Division, announces the opening of a Boston Office at 250 Stuart Street, with R. P. Bolster, manager of the New England District, in charge.

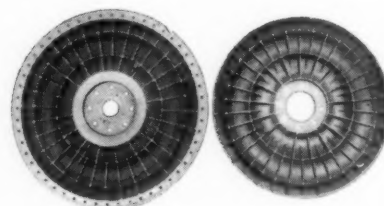
FLUID DRIVE FOR DEFENSE

American Blower Fluid Drives (Hydraulic Couplings) are serving an increasingly important function in national defense

Production of the Marine Type Fluid Drive is going "full speed ahead" for Diesel driven ships. By eliminating torsional vibration, permitting compounded engines to share loads equally, and providing frictionless clutching and declutching, the Fluid Drive improves performance and maneuverability. Many of these same vessels also use American Blower Traction Type Fluid Drives for direct attached scavenging blowers and winches.

Fluid Drives are being installed in increasing numbers in the nation's finest power plants for speed control of mechanical draft fans and centrifugal pumps.

In all the branches of industry, American Blower Fluid Drives are speeding production, preventing breakage of engines and machinery—making a valuable contribution to defense production.



Fluid Drive

(HYDRAULIC COUPLING)

If you are interested in space saving, weight saving, greater maneuverability and smoother operation for motorships—get the facts on Fluid Drive (Hydraulic Coupling). Also ideal for direct attached scavenging blowers, variable speed auxiliary drive, etc. Phone or write the nearest American Blower branch office today for complete data.

AMERICAN BLOWER CORP.

HYDRAULIC COUPLING DIVISION, 6000 Russell St., Detroit, Mich.
New York: 50 W. 40th St., Room 402 • In Canada: Canadian Sirocco Co., Ltd.

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The new office is established to give more complete representation of Superior Diesel Engines in the New England Territory, enlarging and augmenting the excellent representation of Superior's marine distributor, the Walter H. Moreton Corporation of Boston, and the Gustavo Preston Company of Boston who has handled the stationary applications.

NEW DIESEL DRAGGERS ORDERED

MORSE Boatbuilding Company of Thomaston, Maine, has received an order from Philip Carcuru of Gloucester, Mass., for a new dragger to be equipped with a 220 hp. Atlas Imperial Diesel. The vessel will be 92' long, 20' wide and 10' deep and will have a fish capacity of 140,000 pounds.

Morse Boatbuilding Company has also received an order from L. C. McEwen for a 100' dragger powered with a 300 hp. Cooper-Bessemer Diesel.

F-M RECEIVES LARGE ORDER

THE Navy Department has awarded a contract calling for eight sets of propelling machinery for coastal minesweepers amounting to \$311,200 to Fairbanks, Morse & Company.

NEW PRESIDENT OF CRANE CO.

THE Board of Directors of Crane Co. at a special meeting on May 5 elected Mr. John H. Collier as president to fill the vacancy created by the sudden death of Mr. Charles B. Nolte on April 29.

Mr. Collier was born in Chicago in 1884, was educated at Purdue University, and joined Crane Co. on leaving school in 1903. From his original position as core maker's helper 38 years ago, he has progressed through a variety of positions giving him a very intimate and thorough grasp of the company's activities. The later and more important positions in this list are: General Manager, Bridgeport, Conn., plant, Crane Co., 1917-1929. President, Cie Crane, Paris, France, and Chairman, Crane Ltd., London, England, 1929-1933. Vice President In Charge of Manufacturing, Crane Co., Chicago, 1933-1941.

Mr. Collier's first act as president was to issue the following statement: "It is a pleasure for me to know that in taking office as president of this Company, its policies are sound and well-established and that the organization is at a high peak of efficiency. An outstanding

feature of the Crane organization has been the fine spirit of cooperation which has existed throughout. It is my intention to continue the policies which have been in effect, and it will be my endeavor to foster that spirit of cooperation to the fullest extent."

MAXIM OPENS MIDWEST SALES OFFICE

ANNOUNCEMENT comes from the Maxim Silencer Company of the opening of a new sales office at 228 North La Salle Street, Room 1222, Chicago, Illinois, the office to be under the direction of Mr. William A. Damerel.

CATERPILLAR DIESEL PACKAGED POWER BOOKLET

THE versatility of the modern packaged Diesel power plant is clearly shown in a booklet about Diesel-Electric Sets, which has just been issued by Caterpillar Tractor Co.

In addition to a detailed description of the Diesel engine and the self-regulating generator, Caterpillar has listed, discussed, and photographed more than a score of different kinds of installations. These include creameries, race

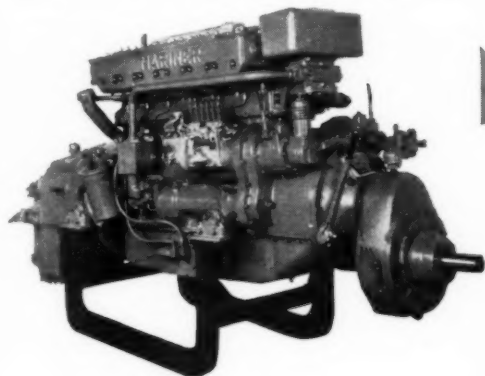
THE CHAROPE NETS A NEAT PROFIT NOW!

MORGAN CITY SHRIMPER OPERATES AT LOWEST POSSIBLE FUEL COST WITH NEW MACK MARINER DIESEL

Mack Mariner engines are available in sizes ranging from 65 to 100 h.p. They are conservatively rated on a continuous sustained duty basis. They give maximum operating economy. Are unusually dependable. Direct factory branch service

is available at 28 tide-water and 14 fresh-water ports. . . Drop a postcard for complete information on a Mack Mariner for your boat. Do it today!

MACK MANUFACTURING CORPORATION
Marine Engine Division, Long Island City, N. Y.



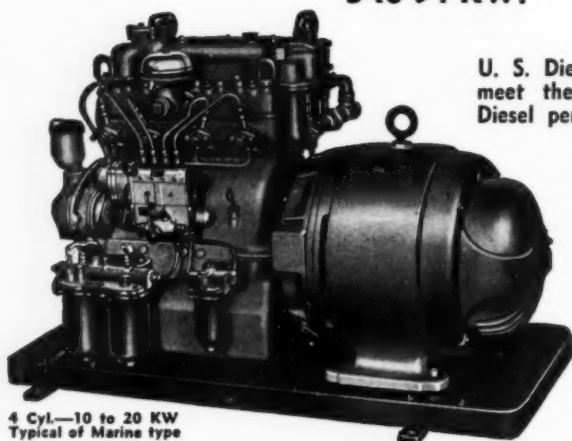
"Charope" operates out of Morgan City, La. Owned by Luke Freia and Pete Dallas. This boat is 46' over-all, with 15' beam and 4'9" draft. Powered by Mack Mariner 605W, 100 h.p., with 3:1 Twin Disc Reduction Gear, turning 38" x 28" screw.



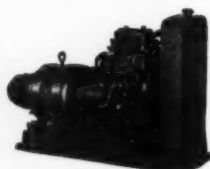
MACK MARINE ENGINES ARE A PRODUCT OF THE BUILDERS OF WORLD-FAMED GASOLINE AND DIESEL-POWERED TRUCKS, BUSES AND FIRE APPARATUS

"U.S." DIESEL ELECTRIC PLANTS

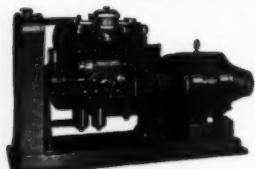
3 to 94 KW.



4 Cyl.—10 to 20 KW
Typical of Marine type



2 Cyl. 5, 7½, 10 KW.

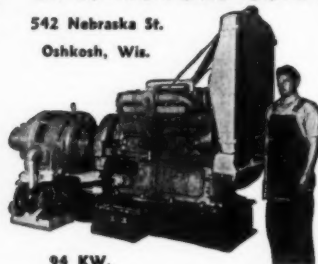


6 Cyl. 25-60 KW.

U. S. Diesel Electric Plants are built to meet the highest standards of modern Diesel performance. Safety . . . smooth running . . . easy starting . . . and economical operation — are the *plus values* which you get in a U. S. Diesel Electric Plant. One, two, four and six cylinder models. 3 to 94 KW. Complete lines for both marine and land service. Write for full information.

U. S. MOTORS CORP.

542 Nebraska St.
Oshkosh, Wis.



94 KW.

Stationary Diesels

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Diesel Locomotives

Diesel Auxiliaries

For Dependable Diesel Starting AND OTHER SERVICES

Specify QUINCY COMPRESSORS

Hundreds of Diesel installations on land and sea have proved the dependability of Quincy Compressors for starting and other services. Modern design and new operating features assure outstanding over-all efficiency. Radiation is 12% greater. Lubrication is more thorough—more positive. Designed for Starting Service requiring intermittent pressures up to 500 lbs. per sq. inch. Available with either gas engine or electric drive or a combination of both. Remember! Specify Quincy for dependable Diesel Starting Service!

Quincy Features—1. Timken Roller Bearings. 2. Semi-Steel Pistons. 3. Perfectly Balanced Crankshaft. 4. Cushioned Steel Valves. 5. Lynite Rods. 6. Constant Level Oiling. 7. Improved Cooling. 8. Nickel Chrome Castings.

QUINCY COMPRESSOR CO., 461 Main St., Quincy, Ill.

New York St. Louis Chicago Cleveland San Francisco

GET NEW FREE BOOK
Contains Complete Information on Quincy Compressors for Diesel Starting and other Service. Write today!

tracks, machine shops, factories, hotels, garages, carnivals, construction jobs, mines, cities, packing plants, etc.

Dimensions and specifications of the company's eight sizes of electric sets are also given, and each of the units is photographed.

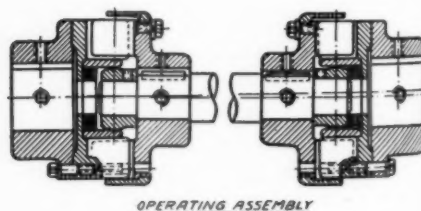
Copies of the electric set booklet may be obtained by writing Caterpillar Tractor Co., Peoria, Illinois, and requesting Form 6344.

NEW FLOATING-SHAFT COUPLING

A NEW floating-shaft flexible coupling employing the L-R principle has been recently announced by Lovejoy Flexible Coupling Co.

This new coupling, designated as L-R Type HKQ, is applicable to either horizontal or vertical drives, and is recommended for the longer distance drives where the space between the driver and driven units cannot be successfully handled by standard couplings; and especially where there is excessive misalignment.

As the accompanying drawing shows, the floating shaft is supported in fixed bearings, entirely independent of the power-transmitting elements—which are thus entirely unaffected by forces generated by the floating shaft itself, and do nothing except transmit useful power.



OPERATING ASSEMBLY

L-R Type HKQ Couplings are made in standard sizes, with bores from 1½" to 8½" (7 to 800 hp. at 100 rpm.), for various distances between fixed shafts, and for handling extreme misalignment.

Further information and details may be had upon request to Lovejoy Flexible Coupling Co., 5009 West Lake St., Chicago, Illinois.

NEW PENFLEX BULLETIN

IN its usual thoroughgoing manner, the manufacturer of Penflex flexible all-metal hose has prepared a new, eight page bulletin covering the application of its products to tank cars.

The bulletin illustrates hose and coupling assemblies suitable for all types of tank car outlets and covers both tank car unloading hose and bronze steam hose. The various hose-coupling assemblies are tabulated as to size and weight. Like all Penflex bulletins, this one is punched for your ring binder. Write for your copy of Bulletin 55-F to Pennsylvania Flexible Metallic Tubing Co., 72nd Street and Powers Lane, Philadelphia, Pa.



**J. A. GRAHAM ELECTED
HONORARY BOARD CHAIR-
MAN OF PUROLATOR . . .
R. R. LAYTE MADE
PRESIDENT**

NEWARK, N. J.—At a special meeting of the Board of Directors of Purolator Products, Inc., Newark, N. J., held on May 1, Mr. John A. Graham was elected Honorary Chairman of the Board.

Active in many phases of the automotive industry since 1907, Mr. Graham is widely known and respected throughout the industry. He was associated with American Simplex, Houdaille and Studebaker Corporation, and since 1925 has been President of Purolator Products, Inc., formerly Motor Improvements, Inc.

Mr. Ralph R. Layte, who has been Executive Vice-President, was elected President of the Company. He has been associated with Purolator since 1925. In 1927 he was made Assistant to the President and was elected First Vice-President in 1938.

**NEW BULLETIN ON MARINE
DIESELS ISSUED BY
FAIRBANKS-MORSE**

CONSTANTLY redesigning to refine basic features proved sound in years of service and to incorporate new ideas as they come along, F-M sets forth its most recent development of its widely known Model 35-F marine Diesels, in the complete and profusely illustrated bulletin 3500-F, just off the press. The present line of model 35-F marine engines are characterized by full Diesel, two cycle, direct fuel injection, open-head combustion types embodying such modern features as complete automatic pres-

CRANE *Continuous* REFINER



IT'S
DIRECT CONNECTED
AND
CONTINUOUS

A clean engine means less maintenance cost . . . less operating cost . . . less interrupted service and longer life.

Engineered and built for every size and type of engine.

Write Now for Bulletin 100L

HONAN-CRANE CORP. Factory and General Offices: LEBANON, INDIANA

Here's Low Cost Power for You!

A COMPLETE "PACKAGED POWER" UNIT

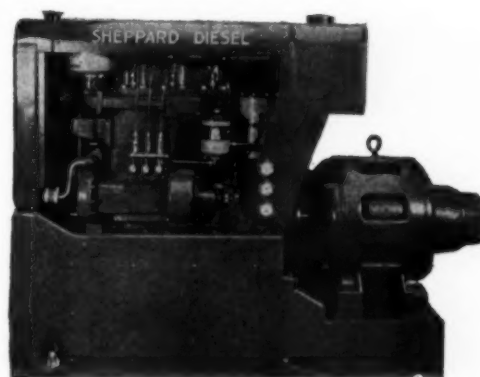
SHEPPARD DIESEL UNITS

Complete with starting batteries, fuel tank, generator—or power take-off. . . Ready to run—just bolt it to the floor and start it.

An opportunity for the small plant to enjoy the benefits of Diesel economy . . . or for large plants to supply power for an added load.

Smooth operation and improved fuel economy assured by pre-combustion chamber design. Full pressure lubrication . . . and many special structural features insure dependable operation and low operating expense.

Write for complete information.



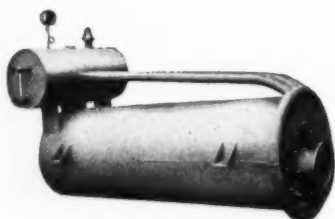
Sheppard Model 6 Diesel Generator Unit . . . 3 cylinders . . . full load rating, 25 Hp. at 1,200 r.p.m. . . . oil cooled pistons . . . silchrome valves and seats . . . individual fuel pumps . . . water pump and fan lubricated for life . . . pressure lubrication . . . replaceable cadmium silver bearings.

R. H. SHEPPARD CO.,

HANOVER, PA.

MAXIM

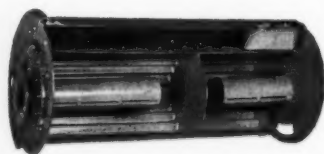
WASTE HEAT UNIT



- CONSERVES EXHAUST HEAT
- PROVIDES EFFECTIVE SILENCING
- INSURES POSITIVE SPARK ARRESTING

There's a triple advantage in using the new Maxim Waste Heat Unit because you can combine the conservation of waste exhaust heat to produce steam or hot water with effective silencing of exhaust noises and, when desirable, with a positive spark arrestor.

It's a three-in-one package of engineering efficiency that is well worth your investigation.



SEND THIS COUPON FOR DETAILS

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94 Homestead Ave., Hartford, Conn.

Please send details on your waste heat unit

☐ for hot water ☐ for steam

Name

Company

Address

City State

sure lubrication, continuous lube oil filtration, needle roller piston pin bearings, enclosure of all working parts and many other distinctively F-M details. Bulletin 3500-F is now available direct from Fairbanks-Morse & Co., 600 South Michigan Ave., Chicago, Illinois.

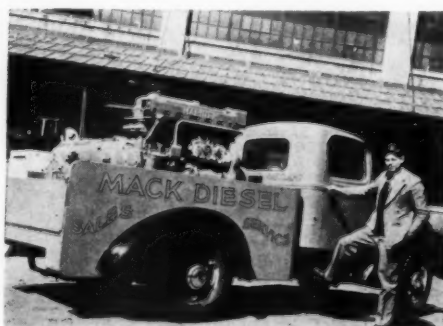
NATIONAL SUPPLY ELECTS VICE PRESIDENT

THE National Supply Co. has announced the election of Austin W. Clark as Vice President, effective as of April 22, 1941.

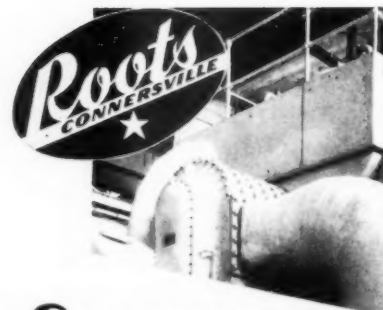
Previous to joining The National Supply Co. in August, 1940, as Assistant Vice President, Mr. Clark, who was born in Anaconda, Montana, and attended the University of California, had been associated for four years with Sears, Roebuck & Co., Chicago, as Assistant Comptroller. Prior to that time, he was for fourteen years with the Hearst Publications in New York City, as Comptroller and Treasurer, and was also for four years with the Cerro de Pasco Copper Corp. in Peru, South America.

A NEW DISTRIBUTOR FOR MACK MARINER DIESELS

ACCORDING to recent announcement, the firm of Nat Gates, Jr. & Son of Crisfield, Md., has been appointed distributor for Mack's line of Mariner Diesel engines. Well experienced in the marine engine field, with Mr. Gates having been in the marine engine business since 1905, this concern will distribute these engines in and around the vicinity of Crisfield.



The photograph shows Mr. Harvey Gates, pictured in front of the Mack factory at Plainfield, N. J., about to take delivery of a new Mack Mariner. Incidentally, the truck before which Mr. Gates is pictured is a new model ED Mack which the concern has purchased to make deliveries of these engines.



SCAVENGING BLOWERS to fit Individual Engine Performance

For reliable performance and economy of operation of 2-cycle Diesel engines, much depends on the scavenging blower. That is why Roots-Connorsville Rotary Positive Blowers are so widely used on important jobs.

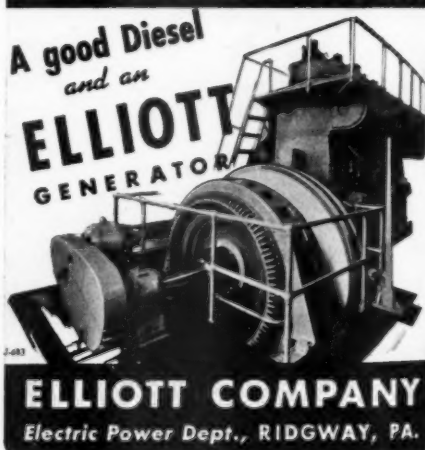
Individually engineered or adapted from standard design, Roots-Connorsville blowers help insure dependable production of low cost Diesel engine power.



ROOTS-CONNORSVILLE BLOWER CORPORATION

106 Midland Ave.,
Connorsville, Indiana

A WINNING TEAM



ELLIOTT COMPANY
Electric Power Dept., RIDGWAY, PA.

OUR 79TH YEAR
PICKERING GOVERNOR CO.
PORTLAND, CONN.

CRACKED HEADS WELDED
• **ENGINES REPAIRED**
Satisfaction **VALVE SEATS**
Guaranteed **HARD SURFACED**

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AN ENGINEERING SERVICE Brooklyn,
New York

Latest Diesel Patents

A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.

Conducted by C. CALVERT HINES*

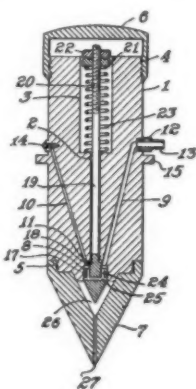
2,192,884

AUTOMATIC FUEL INJECTION VALVE

Horace J. Frank, Pittsburgh, Pa.

Application July 3, 1937, Serial No. 151,902

1 Claim. (Cl. 299-107.6)



A fuel valve for internal combustion engines comprising a valve body having fuel inlet and outlet passages, a cylindrical valve chamber communicating with said passages, a cylindrical valve forming a seal with the walls of said chamber, an air vent extending from said valve chamber to the side of the valve body, means for opening said vent, a conical-shaped screw cap constituting the lower end of the valve body and forming a fire cup delivery chamber beneath the valve chamber, the outlet passage extending through the tip of said screw cap, a valve stem extending upwardly through the valve body, an end cap at the upper end of the valve body forming a chamber for the end of a valve stem, coil springs disposed around the valve stem abutting at one end against the valve body and at its other end against adjustable end abutments formed at the top end of the valve stem, a flow passage through the valve body extending from the upper face of the valve and through the cylindrical wall of the valve, the lower end of the valve being shaped complementary to the bottom wall of the fire chamber, said valve being operative in response to pressure of said spring to normally close to seal the valve chamber against the flow of fuel from the inlet passage, and being further operative to displace the valve downwardly to cause the flow of fuel from the inlet passage through the valve passage into the fire chamber.

2,203,838

COMBUSTION OF FUELS

George B. Murphy and William H. Hubner, Chicago, Ill., assignors to Universal Oil Products Company, Chicago, Ill., a corporation of Delaware

No Drawing. Application September 27, 1937, Serial No. 165,942

4 Claims. (Cl. 123-1)

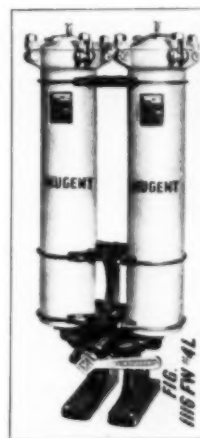
1. The method of increasing the knock value of Diesel fuels in a compression ignition engine which comprises introducing free chlorine thereto through the air-intake of said engine to accelerate combustion of the Diesel fuel.

* Patent Attorney, 811 E Street, N.W., Washington, D. C.

NUGENT FILTERS WILL NOT Remove Diesel Oil ADDITIVES

NUGENT Patented OIL FILTERS are strongly advocated by leading Diesel engine manufacturers and principal oil companies because of the special ability of these efficient filters not to change the original composition of the oil, nor to remove the special additives put into the original oil during refining processes.

No chemicals or diatomaceous earth are used in the filter mediums of Nugent Filters, because these materials may remove the very ingredients the oil companies have experimented with for years to put in their oils to enhance their lubrication qualities. Now that they have attained this high degree of efficiency, which prevents gumming, sticking rings, and formation of engine varnish, it would be ruinous to use an improper filter. It has been found that the use of improper filters changes the chemical structure of some oils so as to destroy the adherence as well as cohesion of the oil on the bearings; in other words, allowing metal to metal contact. Write for complete information on Nugent Filters for fuel and lubricating oil.



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Available in 7 sizes, from 1 to 130 G.P.M.—Send for Bulletin 7A.



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Oil Filters, Oiling and Filtering Systems, Telescopic Oilers, Oiling Devices, Sight Feed Valves, Flow Indicators, Compression Union Fittings, Oil Pumps, Etc.
415 N. HERMITAGE AVE. Estab. 1897. CHICAGO, ILL.

NUGENT Patented Pressure Filters have 20 TIMES MORE ACTUAL FILTERING AREA than most filters of comparable size. Nugent's special woven, acid resisting, lintless textile filter element removes particles as small as .0003" to produce 99-8/10% clean oil. In asking for quotations, please mention gals. per min. circulated and viscosity of oil at operating temperature.

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On many a job in marine, truck, tractor, rail and stationary fields, Diesels with valve seats ground with the HALL ECCENTRIC Valve Seat Grinder are outperforming similar engines not so serviced... That's because HALL ECCENTRIC grinding produces seats of such precision and finish that greater compression is produced and is maintained for longer. This insures higher operating efficiency and lower operating costs... Valves refaced with the HALL Wet Type Valve Refacer have a precision and finish to match valve seats ground by the HALL ECCENTRIC method... Write for catalog today.

THE HALL MANUFACTURING CO.
1652 WOODLAND AVE. TOLEDO, OHIO

At extreme right are shown Model ED Standard type ECCENTRIC Grinder for seats of 2 1/2" to 4" diameter and Model 4844 Heavy Duty Diesel type ECCENTRIC Grinder for seats of 3-3/32" to 6" diameter... Write today for catalog describing these and other types of HALL Grinders as used by over 100 factories as well as by Army and Navy depots and thousands of fleets and service shops.



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COLUMBIA A. C. GENERATORS

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Sizes: 1 to 300 KVA
Speeds 1800, 1200, 900, 720, 600, 514, 450 R.P.M.
Single or 3 Phase

Furnished with either direct connected or belted exciter. Prompt shipment.

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A. C. Generator with Direct Connected Exciter

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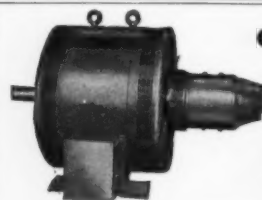


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933 EAST 95th STREET, CHICAGO, ILL.

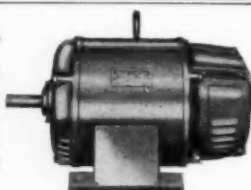
PETROMETER
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Waukesha Silver Comet Diesel Engine, Model 6 D 140, 6 cylinder, 140 hp., connected by V-Belt drive to Allis-Chalmers 240 v., 50 kw. D. C. generator, still set up. Will sell separately or as a complete unit.
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GENERATORS
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For Diesel and gasoline engine drive

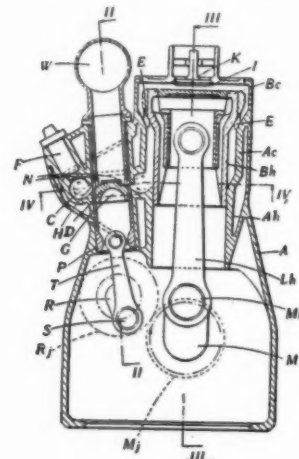
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For all applications Stationary and Marine



STAR generators and motors are extensively used in both stationary and marine service. STAR gear motors are made in both planetary and worm gear types with and without integral brakes.

STAR ELECTRIC MOTOR CO. BLOOMFIELD, NEW JERSEY

2,205,608
INTERNAL COMBUSTION ENGINE
Charles Joseph Toth, Montevideo, Uruguay
Application May 19, 1938, Serial No. 208,891
In Great Britain September 8, 1937
10 Claims. (Cl. 60-13)



1. A compound expansion internal combustion engine comprising a two-stroke reciprocating engine having a cylinder having an expansion space and a precompression space, and a piston reciprocable in the cylinder to precompress air in the precompression space, a toroidal combustion chamber communicating with the expansion space, means for injecting fuel into the combustion chamber, means for transferring precompressed air from the precompression space to the expansion space, a rotary gas engine, and means for transferring the products of combustion from the expansion space to the rotary gas engine for secondary expansion therein.

2,200,260
METHOD AND COMPOSITION FOR IMPROVING DIESEL FUEL IGNITION
Alvin A. Burton, Albany, Calif., assignor to Standard Oil Company of California, San Francisco, Calif., a corporation of Delaware
No Drawing. Application May 1, 1939, Serial No. 271,169
12 Claims. (Cl. 44-9)

1. An improved Diesel fuel comprising a hydrocarbon fuel oil containing between about 0.1% and about 10.0% by weight of chloropicrin.

PITTSBURGH PISTON METER MEASURES FUEL OIL FOR DIESEL PLANT

The Pittsburgh Piston Meter, with Air Eliminator and Strainer, mounted on a portable truck, can be easily moved to where the tank car is spotted. By meter measure, this Diesel Power Plant is "insured" against fuel delivery shortages.



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PITTSBURGH EQUITABLE METER CO.
PITTSBURGH, PENNA.

GINE
Uruguay
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GIVE YOU ALL THESE FEATURES

1. Silent Watchman (Patented).
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3. Sleeve cylinders.
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5. Reversible shell type silver alloy bearings.
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7. Completely enclosed.

They insure long life, high efficiency, low maintenance—all meaning lower power costs. Write for catalogs on your letter-head.

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HEMPHILL DIESEL SCHOOLS

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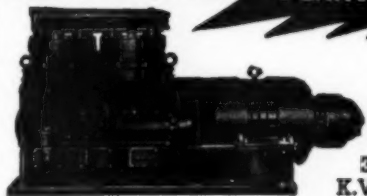
All correspondence concerning graduates of Hemphill Diesel Courses should be sent to one of the following addresses:

31 20 Queens Blvd., L.I.C. NEW YORK • 519 South Western Ave., CHICAGO, ILLINOIS • 7127 San Fernando Road, LOS ANGELES, CALIFORNIA • 621 Monroe Avenue, MEMPHIS, TENNESSEE • 1365 Greenville Street, WASHINGTON, D.C.

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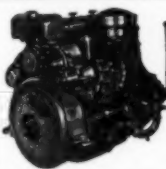
30
K.V.A.

Get this advanced, larger, WITTE Dieselectric for extra power and to save you money every hour you operate! Sets a new high standard for efficient, low cost dependability.

A WITTE for Every Need. 3 to 30 K.V.A., 4 to 40 H.P., vertical or horizontal; 1, 2 and 4 cylinders. Manual, electric or full automatic control. Rugged, compact. Give you power and light for less than ONE CENT a kilowatt! Backed by 70 years of reliability. Soon pay for themselves out of savings in power costs. WRITE now.

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Gray Marine Diesels

Based on the Engine developed and built by General Motors, adapted and equipped for marine use by Gray.
1 to 6 cylinders, 25-165 H.P.
Both Rotations
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L-R TYPE "W"

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Complete range of sizes. All non-lubricated and require minimum maintenance. Used by many engine operators. Recommended by manufacturers.

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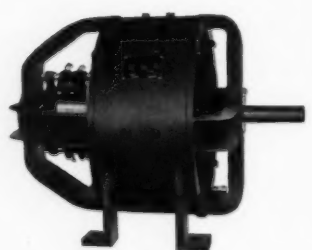


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SIZES: 3 to 125 KW
SPEEDS: 1750, 1450, 1150, 850 R.P.M.
36, 60, 125, 250 Volts
Shunt or Compound Wound.
Prompt Shipment.

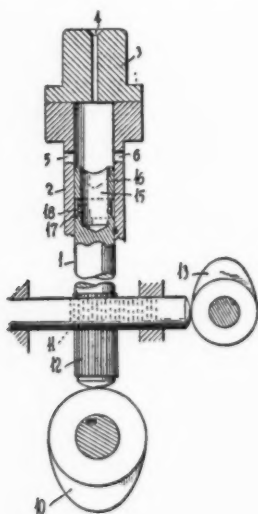
COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave., Cleveland, Ohio



2,195,946
LIQUID FUEL INJECTION PUMP FOR INTERNAL COMBUSTION ENGINES OF THE DIESEL TYPE

Karl Uccusic, Fives, Lille, and Clarence A. Hearley, Marcq-en-Baroeul, France
Application January 5, 1938, Serial No. 183,556
1 Claim. (Cl. 123-139)

A fuel injection pump comprising a cylinder, a plunger reciprocable with constant stroke in the cylinder, said plunger being arranged for relative angular adjustment, a discharge duct at the upper end of said cylinder, a fuel supply chamber, adjacent the cylinder, a plurality of fuel inlet ports in the cylinder wall disposed to be covered by the plunger except when the plunger is near its lower limit of stroke, said plunger being formed with an axial bore for a portion of its length which communicates with a compression space, the portion of the plunger surrounding said bore constituting a relatively thin wall, said plunger bore also having a plurality of lateral ports communicating with an annular groove and said fuel inlet ports, said



thin wall portion being adapted to be forced against the cylinder wall by the hydraulic pressure of the compressed fuel in said compression space, said plunger having a head so rounded as to form a cylindrical surface having its axis normal to and intersecting the plunger axis and a radius equal to that of the plunger, said head serving to cut off said inlet ports at various points along the edge of said surface if said plunger is turned around its longitudinal axis, and means for effecting said relative angular adjustment of the plunger about its longitudinal axis to vary the time of the closing of said fuel inlet ports by said head.

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